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(54) [Title of Invention]
ENDOSCOPE APPARATUS

(57) [Abstract]
[Purpose]
To provide an endoscope apparatus capable of performing fluorescence observation and normal observation selectively.

[Constitution]
An endoscope apparatus 1 is provided with an endoscope 2, a light source 3 for normal observation and a light source 4 for fluorescence observation, and is connected to an adapter 5 for light source. The adapter 5 for light source is provided with an illumination light-switching device 6 as an illumination light switching means. On the other hand, an adapter 9 for image detecting is connected to an ocular part 28 as well as a camera 7 for normal observation and a camera 8 for fluorescence observation. In the adapter 9 for image detecting, an image detecting switching device 10 is provided to switch and introduce a photographed image to a camera for either normal observation or fluorescence observation. A video processor 11 is connected to the camera 7 for normal observation and a fluorescence image processing apparatus 12 is connected to the camera 8 for fluorescence observation. The illumination switching device 6, the image detecting switching device 10, and normal endoscope image and fluorescence endoscope images displayed on a monitor 14 are synchronous-controlled by a synchronous control apparatus 13.

[Claims]
[Claim 1]
By an endoscope apparatus which observes endoscope images of an are to be examined by displaying them on the monitor,

an endoscope apparatus which is characterized by having:
an endoscope including an illumination optical system and an observation optical system; a light source apparatus for normal observation to irradiate illumination light for performing normal endoscope observation;
a light source apparatus for fluorescence observation to irradiate excitation light for performing fluorescence observation;
an adapter for light source for connecting the aforesaid light source for normal observation and the light source for fluorescence observation with a light guide extended from the illumination optical system;
an illumination light switching means which selectively switches the illumination light from the light source for normal observation and the excitation light from the light source for fluorescence observation that are connected to the adapter for light source and introduces the light to the aforesaid light guide;
an image detecting means for normal observation for detecting an observation image of an examining area irradiated with illumination light from the aforesaid light source for normal observation;
an image detecting means for fluorescence observation for detecting an observation image of an area to be examined irradiated with excitation light from the aforesaid light source for fluorescence observation;
an adapter for image detecting which connects between the ocular part where the image of the subject is acquired by the observation optical system of the aforesaid endoscope is transmitted and the aforesaid image detecting means for normal observation or fluorescence observation;
an image detecting means switching means which switches the image detecting means for normal observation and the image detecting means for fluorescence observation and introduces the images that are transmitted to the ocular part, connected to the adapter for image detecting, to corresponding image detecting means;
a video processor for converting electrical signals of the observation images detected by the aforesaid image detecting means for normal observation into image signals;
a fluorescence image processing means for converting electrical signals of the observation images detected by the aforesaid image detecting means for fluorescence observation into image signals; and
a synchronous control means to synchronize the aforesaid illumination light switching means, the image detecting switching means, and normal endoscope images and fluorescence endoscope images displayed on the monitor.

[Detailed Description of the Invention]
[0001]
[Technical Field]
This invention relates to an endoscope apparatus capable of acquiring a normal endoscope image and a fluorescence endoscope image without exchanging either the light source for irradiating examining areas or the image detecting apparatus between that used for normal observation and fluorescence observation.

[0002]
[Prior Art]
In recent years, techniques such as auto-fluorescence generated from living tissue and drug-induced fluorescence generated by injecting a fluorescent drug into the organism beforehand and produce two-dimensional images which are used to diagnose the degeneration of tissues of the organism or a state of the disease (for example, the type of the disease or the extent of infiltration), such as a cancer are disclosed in the US Patents 4556057 and 5042494.

[0003]
If light is irradiated to living tissue, the fluorescence of a wavelength longer than that of the excitation light will be emitted.
Fluorescence substances in the organism are, for example, collagen, NADH (nicotinamide adenine dinucleotide), FMN (flavin mononucleotide), pyridine nucleotide, etc. Recently, the interrelation between these substances in the organism emitting fluorescence light and diseases is becoming clear, and the diagnosis of cancer, etc. is possible from this fluorescence.

[0004]
Alternatively, a fluorescence substance such as HpD (hematoporphyrin), Photofrin, ALA(δ-amino levulinic acid), etc., may be injected into an organism. These substances have a tendency to accumulate in cancerous tissue, and a diseased area can be diagnosed by observing the fluorescence after injecting any of these substances into an organism.

[0005]
[Problem to be Solved by the Invention]
However, when the above-mentioned fluorescence observation is performed by an endoscope apparatus, since the light source and the image detecting means for normal observation are arranged in the endoscope apparatus, the light source and the image detecting means for normal observation have to be exchanged with ones for fluorescence observation in order to

perform fluorescence observation and this exchange is troublesome. The devices for fluorescence observation and normal observation could not be used at the same time.

[0006]
This invention is formed in consideration of the above-mentioned matters and aimed to provide an endoscope apparatus which can perform normal observation and fluorescence observation selectively without exchanging the light source apparatus and the image detecting means for normal observation with ones for fluorescence observation.

[0007]
[Means to Solve the Problems]
An endoscope apparatus of this invention which is to observe an endoscope image of an area to be examined on a monitor and is provided with:
an endoscope including an illumination optical system and an observation optical system; a light source apparatus for normal observation to irradiate illumination light for performing normal endoscope observation;
a light source apparatus for fluorescence observation to irradiate excitation light for performing fluorescence observation;
an adapter for light source for connecting the aforesaid light source for normal observation and the light source for fluorescence observation with a light guide extended from the illumination optical system;
an illumination light switching means which selectively switches the illumination light from the light source for normal observation and the excitation light from the light source for fluorescence observation that are connected to the adapter for light source and introduces the light to the aforesaid light guide;
an image detecting means for normal observation for detecting an observation image of an examining area irradiated with illumination light from the aforesaid light source for normal observation;
an image detecting means for fluorescence observation for detecting an observation image of an area to be examined irradiated with excitation light from the aforesaid light source for fluorescence observation;
an adapter for image detecting which connects between the ocular part where the image of the subject is acquired by the observation optical system of the aforesaid endoscope is transmitted and the aforesaid image detecting means for normal observation or fluorescence observation;
an image detecting means switching means which switches the image detecting means for normal observation and the image detecting means for fluorescence observation and introduces the images that are transmitted to the ocular part, connected to the adapter for image detecting, to corresponding image detecting means;
a video processor for converting electrical signals of the observation images detected by the aforesaid image detecting means for normal observation into image signals;
a fluorescence image processing means for converting electrical signals of the observation images detected by the aforesaid image detecting means for fluorescence observation into image signals; and
a synchronous control means to synchronize the aforesaid illumination light switching means, the image detecting switching means, and normal endoscope images and fluorescence endoscope images displayed on the monitor.

[0008]
[Effect]
According to this constitution, the adapter for light source is connected with both light sources for normal observation and fluorescence observation and the adapter for image detecting is connected with both image detecting means for normal observation and fluorescence observation while they are connected by the synchronous control means. Thereby, a normal observation and a fluorescence observation can be performed without exchanging a light source and an image detecting means

[0009]
That is, for normal observation, a normal endoscope image is displayed on the screen of a monitor in synchronization with the light source for normal observation, the image detecting means for normal observation, and the video processor via the synchronous control means.

[0010]
Next, for fluorescence observation, by outputting a synchronous signal, a fluorescence endoscope image is displayed on the screen of the monitor in synchronization with the light source for fluorescence observation, the image detecting means for fluorescence observation, and the fluorescence image processing means by actuating reflection mirrors of the illumination light switching means and the image detecting switching means.

[0011]
[Embodiment]
Hereafter, embodiments of this invention will be explained referring to the drawings. Fig. 1 through Fig. 5 relate to one embodiment of this invention.

Fig. 1 is an explanatory drawing showing the schematic structure of an endoscope apparatus. Fig. 2 is an explanatory drawing showing a rotatable filter. Fig. 3 is a diagram showing the relationship of the fluorescence sensitivity and the wavelength when laser light irradiates normal areas and lesions. Fig. 4 is a sectional drawing showing the schematic structure of an image intensifier. Fig. 5 is a block diagram of an image processing apparatus.

[0012]
An endoscope apparatus of this invention is to perform normal and fluorescence observation without exchanging a light source and an image detecting apparatus and it is comprised of an endoscope, light sources for normal and for fluorescence observation, and image detecting apparatuses corresponding to each light sources respectively and image processing apparatuses corresponding to each image detecting apparatus respectively.

[0013]
As shown in Fig. 1, an endoscope apparatus 1 is provided with:
an optical endoscope (hereafter an endoscope) 2 in which an observation optical system 22 and an illumination optical system 23 at the distal end of an insertion part 21 are arranged;
a light source 3 for normal observation with a xenon lamp 31 for normal observations which is used as a light source to supply the illumination light to the illumination optical system 23 of the endoscope 2; and
a light source 4 for fluorescence observation to supply a He-Cd laser light for fluorescence observation, for example.

[0014]
The light source 3 for normal observation and the light source 4 for fluorescence observation are connected to the adapter 5 for light source via light-guide paths such as a relay lens 32 and a light guide 41.
The rear end of the light guide 26, which inserts a universal cord 25 extended from the side of the holding part 24 of the operator side of the endoscope 2, is provided the light guide connector 26a which is connected to the adapter 5 for light source. In the adapter 5 for light source, the illumination light from the light source 3 for normal observation and the laser light from the light source 4 for fluorescence observation are entered.
From these two types of illumination light, the illumination light is introduced to the rear surface of the light guide via an optical lens 63 by switching the angle of a reflection mirror 62 by the illumination light switching device 6, which is an illumination light switching means to selectively change the angle of the reflection mirror 62 that is actuated by a driver 61.

[0015]
On the other hand, while the adapter 9 for image detecting is connected to the ocular part 28 provided at the rear end of the holding part of the endoscope 2, it is also connected to: a camera 7 for normal observation as the image detecting means for normal observation in which an image forming optical system 71 and a CCD 72, etc to detect observation images of an area to be examined irradiated with the illumination light from the light source 3 are arranged, a rotatable filter 81 described later which detects observation images of the area to be observed irradiated with the laser light from the light source 4 for fluorescence observation, a drive motor 82 for rotating this rotatable filter, an image intensifier (hereafter, abbreviated to I.I.) 83 described later, a camera 8 for fluorescence observation as the image detecting means for fluorescence observation in which a CCD 84, etc. are arranged.

[0016]
In the aforesaid adapter 9 for image detecting, an image detecting switching device 10 is a switching means for an image detecting means to introduce images of subject transmitted to the ocular part 28, connected to this adapter 9, to the camera 7 for normal observation or the camera 8 for fluorescence observation. This image detecting switching device 10 consists of a driver 101 and a reflection mirror 102 which is actuated by this driver 101.

[0017]
While a video processor 11, which converts an electrical signal of the image detected by the CCD 72 into an image signal, is connected to the aforesaid camera 7 for normal observation, a fluorescence image processing apparatus 12 provided with an image processing apparatus 121 (later described) which converts an electrical signal of the image detected by CCD 84 of the aforesaid camera 8 for fluorescence observation into an image signal and a timing controller 122 is also connected the camera 7 so that the image of the subject is displayed on the screen of the monitor 14 via a video switcher.

[0018]
At this time, the illumination light switching device 6, the image detecting switching device 10, the video switcher 131 for switching a normal endoscope image and a fluorescence endoscope image displayed on the monitor 14 are synchronous controlled by the

synchronous control apparatus 13 provided with the timing controller 132. Symbol 15 is a transfer switch that is a foot switch connecting with the timing controller 132 of the synchronous control apparatus 13, and it switches the reflection mirror 62 of the illumination light switching device 6 and the reflection mirror 102 of the image detecting switching device 10 to a state of normal observation or fluorescence observation in synchronization with the drivers 61 and 101 via the timing controller 132 as well as switches endoscope images on the screen of the monitor via the video switcher 131. It is not limited to use a foot switch as a transfer switch and a switch at handle side of the operator can be used.

[0019]
Moreover, the light source 4 for fluorescence observation and the adapter 5 for light source of this figure are connected by inserting the end of the light guide 41. The aforesaid adapter 9 for image detecting and the camera 7 for normal observation and the camera 8 for fluorescence observation are connected by one-touch with a screw lock and a key lock, etc that are not illustrated.

[0020]
Furthermore, a first filter 81a for the band of 480 – 520nm and a second filter 81b for the band more than 630nm are arranged on the rotatable filter 81. When the 442nm violet light from the He-Cd laser of the light source 4 for fluorescence observation is introduced to the light guide 16a and irradiates an organism to observe a fluorescence image, the organism emits autofluorescence of a wavelength longer than the 442nm violet light by the He-Cd laser. This fluorescence is sequentially detected by the first filter 81a and the second filter 81b of the rotatable filter 81 provided in the camera 8 for fluorescence observation and a fluorescence endoscope image is acquired. In addition, it is well known that, as shown in Fig. 3, the fluorescence sensitivity of a visible region obtained by excitation light of the aforesaid violet light is strong in a normal area and weak in a diseased area such as cancer and is very strong in 480 – 520nm band indicated as λ_1.

[0021]
I.I. 83 arranged in the camera 8 for fluorescence observation, as shown in Fig. 4, is to intensify a weak fluorescence endoscope image passed through the first filter 81a and the second filter 81b of the rotatable filter 81. It is to convert an optical image connected on a photoelectric surface of a fiber plate 83a into an electric image and perform the electrical amplification by transmitting it through a micro channel plate (hereafter abbreviated to MMC). And then the light is entered to a fluorescence light surface 84d and reconverts into an optical image. The fluorescence endoscope image which is photoelectrically amplified by I.I. 83 is formed on the CCD 84 via the image forming lens 84e.

[0022]
As shown in Fig. 5, the image processing apparatus 121 consists of a multiplexer 121a, a frame memory λ_1 121b, a frame memory λ_2 121c, a calculation circuit 121d, a digital to analog converter 121e, etc. After an endoscope image is transmitted by the first filter 81a and the second filter 81b of the rotatable filter 81 arranged in the aforesaid camera 8 for fluorescence observation, the image is formed on the CCD 84 via an image forming lens 84e and electrically intensified by the aforesaid I.I. 83. The digital data which is generated by an image signal processing part 84a which cancels the noise of the endoscope image and amplifies the endoscope image and an analog to digital converter 84b is split into the frame memory λ_1 121b and the frame memory λ_2 121c via the multiplexer 121. Then, the calculation circuit 121d calculates the difference and ratio of the image signal obtained by the first filter 81a and the image signal obtained by the second filter 81b and the video signal is output to the video switcher 131 via the digital to analog converter 121e. In addition, the readout timing of the images obtained by the first filter 81a and the second filter 81b of the rotatable filter 81 is synchronized with the timing of the switch between the first filter and the second filter.

[0023]
Operation of the endoscope apparatus 1 structured as above will be explained. When displaying a normal endoscope image on the monitor 14, the reflection mirrors 62, provided in the illumination light switching device 6 of the adapter 5 for light source, and the reflection mirror 102, provided in the image detecting switching device 10 of the adapter 9 for image detecting, are arranged at an angle of roughly 45 degree against the optical axis as shown in Fig. 1. The video switcher 131 is also switched so that the video signal, converted by the video processor 11 which is connected to the camera 7 for normal observation, is displayed on the monitor 14.

[0024]
In other words, the illumination light emitted from the light source 3 for normal observation is reflected by the reflection mirror 62 and introduced into the light guide 26 and irradiates an area to be observed through the illumination optical system 23. The image, irradiated by the illumination light from this

light source 3 for normal observation, is incident to the adapter 9 for image detecting via the ocular part 28 and reflected by the reflection mirror 102, and then introduced to the camera 7 for normal observation. This image introduced to the camera 7 for normal observation is projected on the CCD 72 via the image forming lens 71 and converted into an electrical signal. Then, the image detecting signal converted by the video processor 11 is displayed to be a normal endoscope image on the screen of the monitor 14 via the video switcher 131.

[0025]
Next, when displaying a fluorescence endoscope image on the monitor 14, a switching signal is output by stepping on the foot switch 15 first so as to change the normal observation state to the fluorescence observation state. This switching signal is input to the timing controller 132, and then the timing controller 132 output this signal to the driver 61 of the illumination light switching device 6 in the adapter 5 for light source, the driver 102 of the image detecting switching device 10 in the adapter 9 for image detecting, and the video switcher 131.
By this, the angles of the reflection mirror 62 and the reflection mirror 102 are changed to parallel to the optical axis and the video switcher 131 is also switched to display the image signal from the fluorescence image processing apparatus 12.

[0026]
In other words, the illumination light from the light source 3 for normal observation is reflected by the reflection mirror 62, and the 442nm violet light by the He-Cd laser from the light source for fluorescence observation is introduced to the area to be examined via the illumination optical system 23 to be irradiated. The image of the subject area irradiated by the laser light from the light source 4 for fluorescence observation enters the adapter 9 for image detecting via the ocular part 28 and introduced to the camera 8 for fluorescence observation after passing though the optical lens 103. Then it is transmitted by the first filter 81a and the second filter 81b on the rotatable filter 81 rotated by the motor 82, and projected on the CCD 84 to be converted into an electrical signal after photoelectrically amplified by the I.I. 83. The electrical signal is then converted into the image detecting signal by the fluorescence image processing apparatus 12 and a fluorescence endoscope image is displayed on the monitor 14 via the video switcher 131.

[0027]
In addition, when performing normal observation after the fluorescence observation, by stepping the foot switch 15 to output a switching signal, the reflection mirror 62 and the reflection mirror 102 in the fluorescence state is switched to the angle at roughly 45 degree to the optical axis and the video switcher 131 is switched to display the video signal from the video processor 11 connected to the camera 7 for normal observation to be displayed on the monitor 15.
Symbol 85 represents an optical lens.

[0028]
As described above, an endoscope apparatus is provided with an endoscope, a light source and a camera and a video processor for normal observation, a light source and a camera and a fluorescence image processing apparatus for fluorescence observation, and both light sources are integrated by connecting to the adapter for light source and both cameras are integrated by connecting to the adapter for image detecting. Thus, the endoscope apparatus can perform normal and fluorescence observation without exchanging the light source and the image detecting apparatus by one transfer switch by synchronously controlled by the synchronous control apparatus containing the transfer switch.

[0029]
Fig. 6 and Fig. 7 are explanatory drawings showing the schematic structure of an endoscope apparatus of the second embodiment of this invention. As shown in Fig. 6, a fluorescence endoscope image and a normal endoscope image are displayed on the same screen of the monitor in this embodiment and it is provided with a control apparatus 13' has the function of a superimposition 133 instead of the video switcher 131 of the aforesaid synchronous control apparatus 13. By this, when a switching signal from a foot switch 15 is input to a timing controller 132, a fluorescence endoscope image can be superimposed on the normal endoscope image on the screen of a monitor 14. Since other components and operation/effect are the same as the aforementioned embodiment, the same symbols are utilized for the same parts and the explanation of those will be omitted.

[0030]
In order to display both fluorescence endoscope image and normal endoscope image simultaneously and in real time on the screen of the monitor 14, switch timings of reflection mirrors 62 and 102 operated by a drivers 61 and 101 of an illumination light switching device 6 and an image detecting switching device 10 are performed at high speeds about 1/60 – 1 seconds.

[0031]
In addition, as shown in diagram 7, the following two operations will be repeated every 1/30 seconds for accumulations and readouts of images if the reflection mirrors are switched at 1/30 seconds.
One: an endoscope image enters a camera 7 for normal observation described as a first camera in the diagram, which is connected to an adapter 9 for image detecting, for a 1/30 seconds, the accumulation and readout of an endoscope image are performed during this 1/30 seconds.
The other: an endoscope image enters a camera 8 for fluorescence observation described as a second camera in the diagram which is connected to the adapter 9 for image detecting for 1/30 seconds. Since a rotatable filter 81 with a first filter 81a and a second filter 81b is rotating at speeds of 1/30 seconds in the camera 8 for fluorescence observation, the camera 8 for fluorescence observation receives endoscope images, passed through the first filter 81a and the second filler 81b, every 1/60 seconds. Thus, each accumulation and readout of the endoscope images passed through the first filter 81a and the second filter 81b are performed during the 1/60 seconds.

[0032]
By the way, when switch timings of the reflection mirrors 62 and 102 by the driver 61 and 101 of the aforesaid illumination light switching device 6 and the image detecting switching device 10 are performed at high speeds, illumination light of the light source 3 for normal observation may enter and cause burn in damage to the supersensitive camera 8 for fluorescence observation which detects weak fluorescence images. Therefore, by making the switch timing of the reflection mirror 102 as follows, it can prevent a damage of burn in to the camera 8 for fluorescence observation from the illumination light of the light source 3 for normal observation entering the camera.

[0033]
That is, as shown in diagram 8, the illumination light of the light source 3 for normal observation (which is described as a first light source) and laser light of the light source 4 for fluorescence observation (which is described as a second light source) are emitted at the same cycle by the switch of the reflection mirror 62. The time to enter the camera 7 for normal observation is stretched by t1 seconds before and after the emission period of the illumination light of the light source 3 for normal observation.

[0034]
According to this, t1 seconds after the first light source is switched to the second light source, the reflection mirror 102 is switched to the side of camera 8 for fluorescence observation (the second camera). T1 seconds before the second light source is switched to the first light source, the reflection mirror 102 is switched on the side of the camera 7 for normal observation (the first camera). Since the illumination light of the light source 3 for normal observation is prevented to enter the camera 8 for fluorescence observation, the damage to the camera 8 for fluorescence observation can be prevented.

[0035]
In addition, the accumulation of image and transfer to the first camera is performed during the cycle of the light source. The accumulation and transfer to the second camera is performed at the above-mentioned timing.

[0036]
In addition, if the reflection mirrors 62 and 102 are switched at high speeds by the driver 61 and 101 of the illumination light switching device 6 and the image detecting switching device 10, they will not endure the long term usage. Thus, it is designed to switch easily at high speeds by constituting a switching means of a switching device as follows.

[0037]
In this embodiment, an image path converting device 16 is arranged at the angle of roughly 45 degree as shown in Fig. 9 instead of constituting a switching device by the combination of drivers and reflection mirrors. The image path converting device 16 forms a through-hole 161a and a mirror 161b on a rotation plate 161 as an image path converting means. The rotation plate 161 is rotated at a predetermined speed by a motor 162. Therefore, the high speed switching is possible since the rotation plate 161 is rotated by the motor 162.

[0038]
There is a possibility of causing an damage on a supersensitive camera for fluorescence observation by light such as external light which enters an adapter for image detecting other than by the switch timing of reflection mirrors at high speeds.
Therefore, structuring the adapter for image detecting as follows, light other than light with determined wavelengths such as external light is prevented entering a fluorescence camera through the adapter for image detecting.

[0039]
An incident prevention means 17 as shown in Fig. 10 detects light incident to the adapter 9 for image detecting by a light receiver 172 via a beam splitter

171 at first. Then, a blocking filter 172a placed in front of the light receiver 172 blocks the light except the wavelength of laser light emitted from the light source 4 for fluorescence observation. That means, as shown in Fig. 11, when the illumination light from the light source for normal observation is entered regularly (1), when external light is unexpectedly entered (2), or when external light enters and reached to the light receiver 172 (3), light to the camera for fluorescence observation can be prevented by outputting a signal to the driver 101 and actuating the mirror 102 on the A side by force.

[0040]
In addition to the above-mentioned optical means, a switch 174 to detect that the adapter for image detecting is connected to the ocular part 28. By having the function to prevent damage to the camera at the time of attaching or removing the ocular part 28, safety is ensured. In other words, when it is detached, light incidence to the camera for fluorescence observation will be prevented by actuating the driver 101 by force to incline the mirror 102.

[0041]
Furthermore, as shown in Fig. 12, when the camera for fluorescence observation is attached/detached to the adapter 9 for image detecting, external light may enter I.I. 83 and cause burn in on the supersensitive camera 8 for fluorescence observation. Thus, a switch 182 as a detecting means 18 is provided to detect that the camera 8 for fluorescence observation is connected to the adapter 9 for image detecting. In other words, since the switch 182 is turned off by detaching the camera 8 for fluorescence observation from the image detecting adapter, the power supply to I.I. 83 is stopped and the shutter closes. Symbol 181 indicates the high voltage power supply.

[0042]
The camera for fluorescence observation is located in a clean area because it is directly connected to the ocular part of the endoscope to perform fluorescence observation. Therefore, the camera for fluorescence observation has to be sterilized after an operation. However, sterilizing the large camera for fluorescence observation is difficult and a troublesome. Therefore, by comprising an endoscope apparatus as follows, the sterilization after an operation will be eliminated by having the camera arranged in a different area outside the clean area.

[0043]
As shown in Fig. 13, the adapter 9 for image detecting is connected to the endoscope 2 and this adapter 9 is connected to the camera 8 for fluorescence observation by a flexible cable 91' which contains an image guide 91. By connecting the adapter for image detecting and the camera for fluorescence observation with the flexible cable containing the image guide, sterilization after the operation can be eliminated by arranging the large camera for fluorescence observation outside the clean area and the operation ability of the camera is improved. Since other components and operation/effect are similar to the previous embodiments, the same symbols are utilized for the same parts and the explanation of those will be omitted.

[0044]
Endoscope apparatuses of the first and second embodiments and the aforesaid Fig. 13 can perform normal and fluorescence observation by one transfer switch without exchanging the light source and the image detecting device by controlling synchronously by the synchronous-control device.
According to this embodiment, by constituting the adapter for light source as follows, a normal and fluorescence observation can be performed without exchanging a light source and an image detecting apparatus. In addition, a fluorescence endoscope image is displayed on the screen of the monitor by superimposing like the second embodiment.

[0045]
In this embodiment of Fig. 14, a light source adapter 18 is provided with an illumination light switching device 18', which consists of a driver 181 and a reflection mirror 184, and a timing controller 182 and a superimposition circuit 183. And a light source 3 for normal observation is connected to the light source adapter 18 by a cord 32' containing a light guide 32.

[0046]
In addition, the aforesaid timing controller 182 is to synchronously control the driver 181 of the illumination light switching device 18, the driver 101 of the image detecting switching device 10, and the superimposition circuit 183 by outputting a switching signal. However, in this embodiment, the superimposition circuit 183 and the driver 181 are arranged in the light source adapter. A connecting cable 29 which connects between the driver 101 of the image switching device 10 and the timing controller 182 is inserted in a universal cord of the endoscope 2. Thus, it is unnecessary to provide a signal cable for controlling synchronization. Since other components and operation/effect are the same as the aforesaid embodiments, the same symbols are

utilized for the same parts and the explanation of those will be omitted.

[0047]
In addition, the illumination light switching device 18 and the adapter 9' for image detecting can be synchronized by light like an example in Fig. 15. That is, a synchronous signal from the timing controller 182 is input to the modulator 185. An LED which generates near infrared rays by the frequency modulated wave which is modulated by the modulator 185 is activated via a driver 186. Near infrared rays emitted from LED reflect by walls, the ceiling, etc. and enter the adapter 9' for image detecting. Noise is omitted by a band-pass filter (BPF) 93 of near infrared rays received by the light receiver 92 and it is demodulated into a synchronizing signal by a demodulator 94 and the driver 95 is actuated to change the reflection mirror by this synchronizing signal. Electro-magnetic waves, sound waves, and ultrasonic waves can be used instead of light.

[0048]
In order to perform fluorescence and normal observation, two light sources for fluorescence observation and normal observation have to be prepared. Therefore, one light source can perform both fluorescence and normal observation by constituting the light source as below.

[0049]
As shown in Fig. 16 and 17, the light source apparatus 19 is provided with the rotatable filter 191 which arranged filters 191r, 191g, 191a which sequentially irradiates the visible light between 400-460nm suitable for the excitation light of fluorescence observation of flavin instead of red color (R) and green (G) and blue (B) with different wavelengths in the front of the light source lamp 192. A rotatable filter 81 of the camera 8 for fluorescence observation is provided with a first filter 81a for band in 480 – 520nm and a second filter 81b for bands over 630nm and these filters are arranged to the position corresponding to filter 191a for excitation of the above-mentioned rotatable filter 191.

[0050]
Thus, the rotatable filter 191 and the rotatable filter 81 are synchronously rotated. Thereby, a fluorescence endoscope image is acquired by sequentially detecting fluorescence in each band by the first filter 81a and the second filter 81b while the light is passing the excitation filter 191.

[0051]
In addition, the rotatable filter is synchronously rotated at a 1/60 – 1s cycle, for example.

[0052]
Moreover, the current light source uses the three primary colors of R, G, and B. However, in this embodiment, a filter for excitation light instead of blue light is arranged so that color correction is performed by a CCU (not illustrated) since color is different from the natural color.

[0053]
Furthermore, the timing controller 182 of the light source adapter 18 and the superimposition circuit 183 are not connected and images are always displayed in a condition that a fluorescence endoscope image is always superimposed on a normal endoscope image. Thus, this prevents the phenomenon of light quantity by time division.

[0054]
[Effect of the Invention]
According to this invention described above, an endoscope apparatus which performs normal observation and fluorescence observation selectively without exchanging a light source and an image detecting means for normal observation with ones for fluorescence observation.

[Brief Explanation of the Drawings]
[Fig. 1] Fig. 1 through Fig. 5 relate to one embodiment of this invention. Fig. 1 is an explanatory drawing showing the schematic structure of an endoscope apparatus.

[Fig. 2]
an explanatory drawing showing the scheme of a rotatable filter.

[Fig. 3]
a diagram showing the relationship between fluorescence sensitivity and wavelength when laser light irradiates a normal area and a diseased area.

[Fig. 4]
a cross-sectional view showing a schematic structure of an image intensifier.

[Fig. 5]
a block diagram showing the schematic structure of an image processing apparatus.

[Fig. 6]
Fig. 6 and Fig. 7 are explanatory drawings showing the schematic structure of an endoscope apparatus of the second embodiment of this invention.

[Fig. 7]
a timing chart showing the timing of accumulation and readout of endoscope images.

[Fig. 8]
a timing chart showing the timing of illumination light from a light source and light incident to an image detecting camera.

[Fig. 9]
an explanatory drawing showing the schematic structure of an image path converting device.

[Fig. 10]
an explanatory drawing showing the schematic structure of a external-light incidence prevention means on the side of a camera for fluorescence in the adapter for image detecting.

[Fig. 11]
a timing chart showing the physical relationship between a light receiver and a mirror.

[Fig. 12]
an explanatory drawing showing the schematic structure of a means to detect the connection of the camera for fluorescence observation.

[Fig.13]
an explanatory drawing to show how to attach connection adapter of camera for fluorescence observation.

[Fig. 14]
an explanatory drawing showing a synchronous control means of an endoscope apparatus.

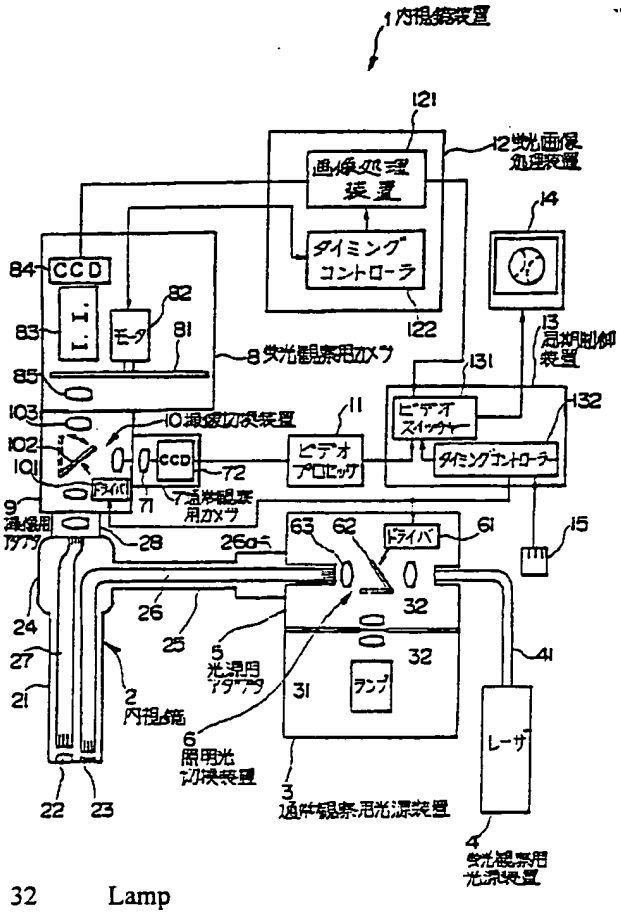
[Fig. 15]
an explanatory drawing showing a synchronous control means of an endoscope apparatus.

[Fig. 16]
an explanatory drawing of other structure of an endoscope apparatus.

[Fig. 17]
an explanatory drawing showing the schematic structure of a filter.

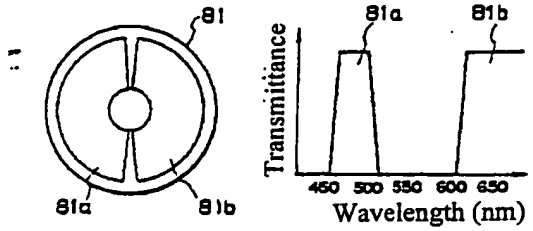
[explanation of symbols]
1...endoscope apparatus
2...endoscope
3...a light source for normal observation
4...light source for fluorescence observation
5...adapter for light source
6...illumination light switching apparatus
7...camera for normal observation
8...camera for fluorescence observation
9...adapter for image detecting
10...image detecting switching apparatus
11...video processor
12...fluorescence image processing apparatus
13...synchronous control apparatus

[Fig. 1]

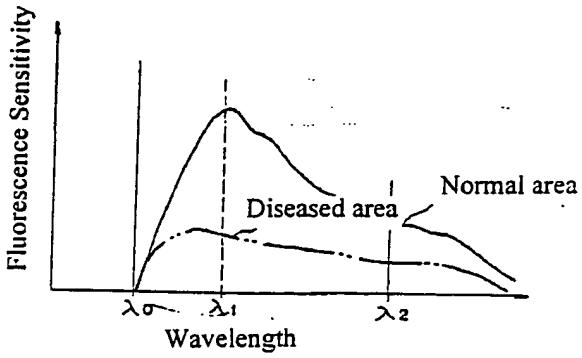


32 Lamp
61 Driver
82 Motor
101 Driver
121 Image Processing apparatus
122 Timing Controller
131 Video switcher
132 Timing controller

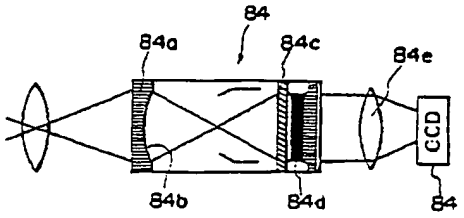
[Fig. 2]



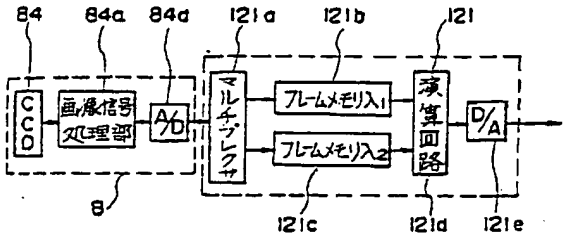
[Fig. 3]



[Fig. 4]

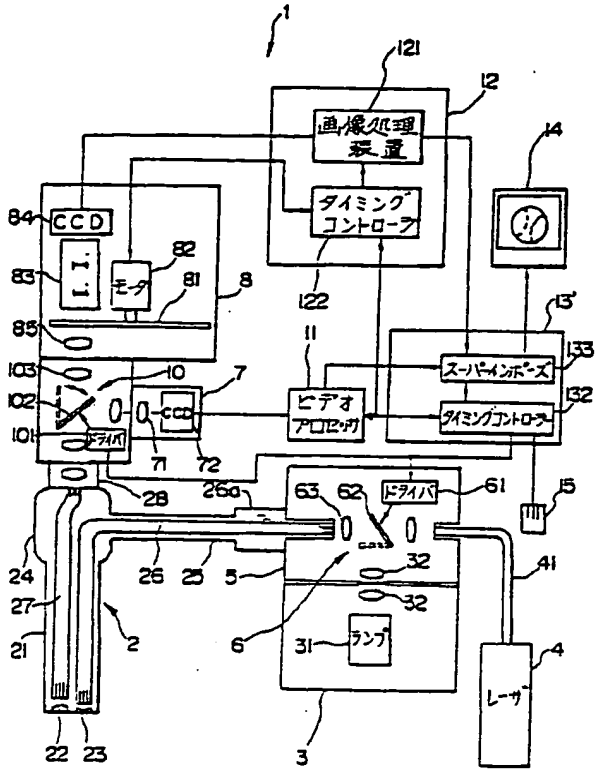


[Fig. 5]



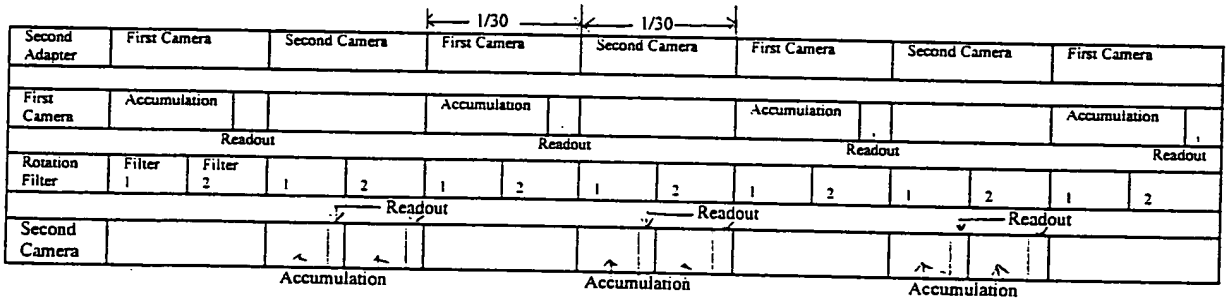
84a Image signal processor
121a Multiplexer
121b Frame memory λ_1
121c Frame memory λ_2
121d Calculation circuit

[Fig. 6]

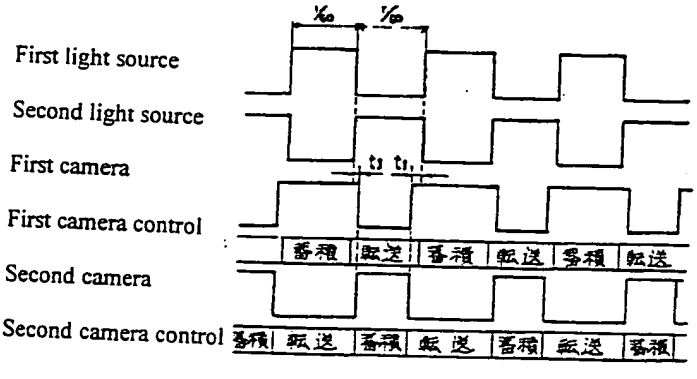


4	Laser
11	Video processor
28	Driver
31	Lamp
61	Driver
82	Motor
121	Image processor
122	Timing Controller
132	Timing controller
133	Superimposition

[Fig. 7]



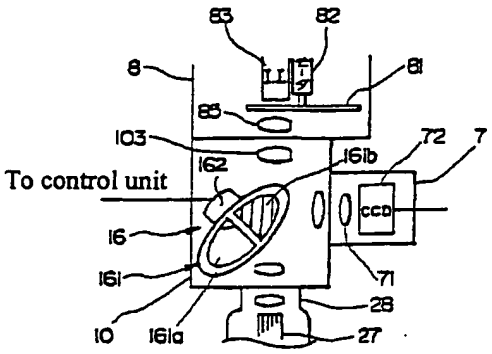
[Fig. 8]



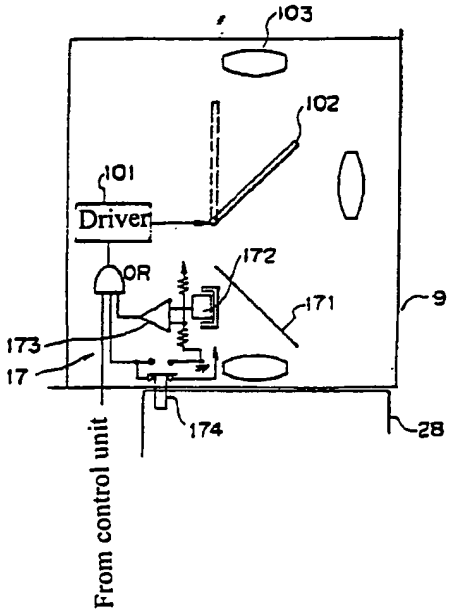
Accumulation/Transfer/Accumulation/Transfer/Accumulation/Transfer

Accumulation/Transfer/Accumulation/Transfer/Accumulation/Transfer/Accumulation

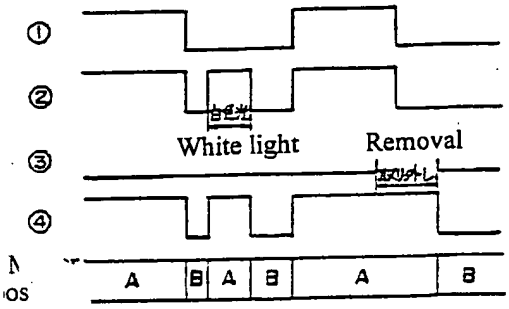
[Fig. 9]



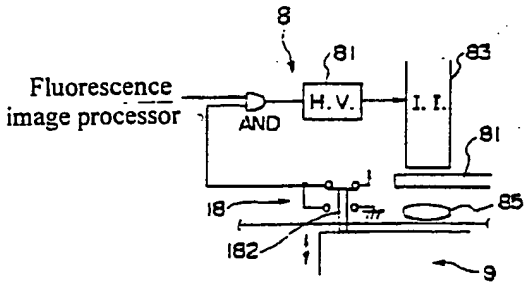
[Fig. 10]



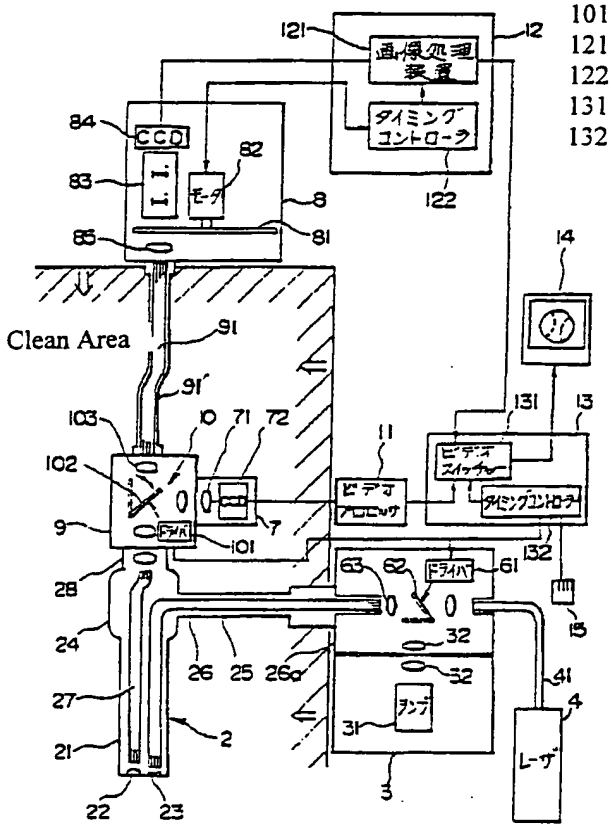
[Fig. 11]



[Fig. 12]

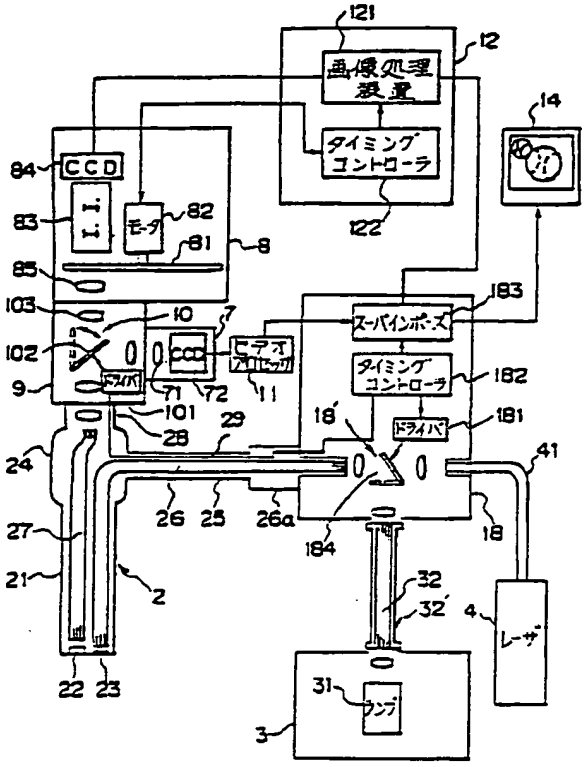


[Fig. 13]

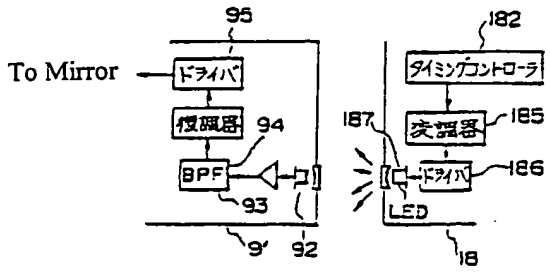


4	Laser
11	Video processor
31	Lamp
82	Motor
101	Driver
121	Image processor
122	Timing Controller
131	Video switcher
132	Timing Controller

[Fig. 14]

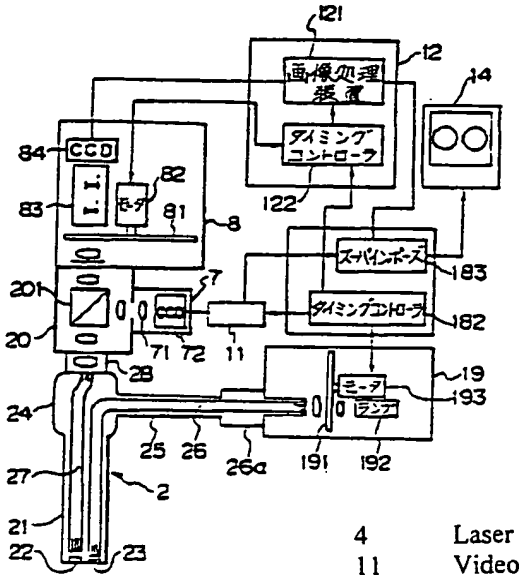


[Fig. 15]



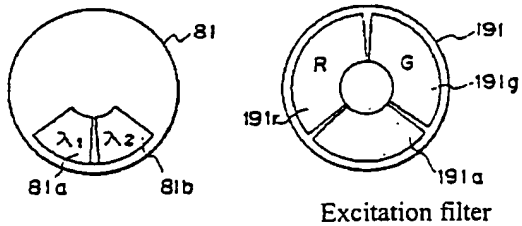
94 Demodulator
95 Driver
182 Timing controller
185 Modulator
186 Driver

[Fig. 16]



4 Laser
11 Video processor
31 Lamp
82 Motor
101 Driver
121 Image processor
122 Timing Controller
131 Video switcher
181 Driver
182 Timing Controller
183 Superimposition
192 Lamp
193 Motor

[Fig. 17]



Excitation filter

DERWENT

MACHINE-ASSISTED TRANSLATION (MAT):

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(57)【要約】

(57)[SUMMARY]

【目的】
蛍光観察或は通常観察を選択的に行える内視鏡装置を提供すること。

[OBJECT]
Provide the endoscope apparatus which can perform selectively fluorescent observation or usual observation.

【構成】
内視鏡装置１には内視鏡２と、光源装置として通常観察用，蛍光観察用光源装置３，４が備えられ、光源用アダプタ５に接続されている。光源用アダプタ５には照明光切換手段である照明光切換装置６が備えられている。一方、接眼部２８には撮像用アダプタ９が接続されると共に、撮像装置として通常観察用，蛍光観察用カメラ７，８が接続されている。撮像用アダプタ９には被写体像を通常観察用或は

[SUMMARY OF THE INVENTION]
Endoscope apparatus 1 is equipped with the usual object for observation, and the fluorescent light source devices for observation 3 and 4, as the light source devices in endoscope 2.

It connects with the adapter for light sources 5.

The adapter for light sources 5 is equipped with the illumination light switching apparatus 6 which is the illumination light switching means.

With such a configuration, while the adapter for an image pick-up 9 is connected to eye-piece part 28, the usual camera for observation

蛍光観察用カメラに切換え導く撮像手段切換手段である撮像切換装置１０が配設されている。通常観察用カメラ７にはビデオプロセッサ１１が接続され、蛍光観察用カメラ８には蛍光画像処理装置１２が接続されている。そして、照明光切換装置６，撮像切換装置１０，モニタ１４に写し出される通常内視鏡画像及び蛍光内視鏡画像は、同期制御装置１３によって同期制御されている。

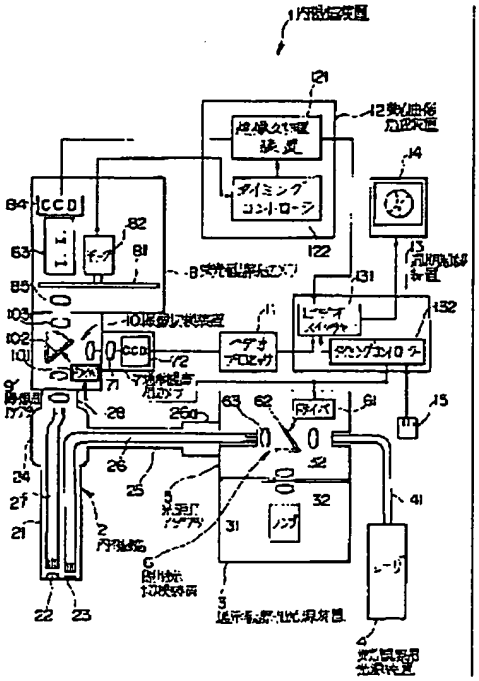
and the fluorescent camera for observation 7 and 8 are connected as an image-pick-up apparatus.

The image-pick-up switching apparatus 10 which is image-pick-up means switching means to switch and guide a copied object image to the usual object for observation or the fluorescent camera for observation is arranged by the adapter for an image pick-up 9.

The video processor 11 is connected to the usual camera for observation 7.

The fluorescent image processing device 12 is connected to the fluorescent camera for observation 8.

And, concerning the illumination light switching apparatus 6, image-pick-up switching apparatus 10, the usual endoscope image copied out on monitor 14, and a fluorescent endoscope image, synchronous control is carried out with the synchronous-control apparatus 13.



[translation of Japanese text in Selection Diagram]
also refer to EXPLANATION OF DRAWINGS

32 lamp
61 driver
82 motor
121 image processor
122 timing controller
131 video switcher
132 timing controller

【特許請求の範囲】 **[CLAIMS]**

【請求項１】 **[CLAIM 1]**
被検部位の内視鏡画像をモニタに写し出して観察する内視鏡装置において、
照明光学系及び観察光学系を内蔵した内視鏡と、

An endoscope apparatus.
In the endoscope apparatus which copies out the endoscope image of an examined region on a monitor, and is observed, the endoscope which built into illumination optical system and

通常内視鏡観察を行うための照明光を照射する通常観察用光源装置と、
蛍光観察を行うための励起光を照射する蛍光観察用光源装置と、
前記通常観察用光源装置及び蛍光観察用光源装置光と照明光学系から延出するライトガイドとを接続する光源用アダプタと、
この光源用アダプタに接続された通常観察用光源装置からの照明光と蛍光観察用光源装置からの励起光とを選択的に切換えて前記ライトガイドに導く照明光切換手段と、
前記観察用光源装置からの照明光によって照射された被検部位の観察画像を撮像する通常観察用撮像手段と、
前記蛍光観察用光源装置からの励起光によって照射された被検部位の観察画像を撮像する蛍光観察用撮像手段と、
前記内視鏡の観察光学系で捕らえた被写体像が伝送される接眼部と前記通常観察用撮像手段及び蛍光観察用撮像手段とが接続される撮像用アダプタと、
この撮像用アダプタに接続された接眼部に伝送された被写体像を対応する通常観察用撮像手段、或は、蛍光観察用撮像手段のどちらかに切換え導く撮像手段切換手段と、
前記通常観察用撮像手段で撮像

the observation optical system, the usual light source device for observation which irradiates the illumination light for performing a usual endoscope observation, the fluorescent light source device for observation which irradiates the excitation light for performing fluorescent observation, the above-mentioned usual light source for observation
The adapter for light sources which connects an apparatus and the fluorescent light-source-device light for observation, and the light guide extended from the illumination optical system, illumination light switching means whereby the illumination light from the usual light source device for observation connected to this adapter for light sources and the excitation light from the fluorescent light source device for observation are switched selectively, and is guided to the above-mentioned light guide, for the above-mentioned observation
Usual image-pick-up means for observation to image-pick up the observation image of the examined region irradiated by the illumination light from a light source device, fluorescent image-pick-up means for observation to image-pick up the observation image of the examined region irradiated by the excitation light from the above-mentioned fluorescent light source device for observation,
the eye-piece part to which the copied object image caught with the observation optical system of the above-mentioned endoscope is transmitted, and above-mentioned usual image-pick-up means for observation, and fluorescent image-pick-up means for observation are connected to the adapter for an

した観察画像の電気信号を画像信号に変換するビデオプロセッサと、
前記蛍光観察用撮像手段で撮像した観察画像の電気信号を画像信号に変換する蛍光画像処理手段と、
前記照明光切換手段と、撮像装置切換手段と、モニタに写し出される通常内視鏡画像及び蛍光内視鏡画像とを同期させる同期制御手段と、
を具備することを特徴とする内視鏡装置。

image pick-up, usual image-pick-up means for observation to correspond the copied object image transmitted to the eye-piece part connected to this image pick-up adapter, or, image-pick-up means switching means switched and guided to one of fluorescent image-pick-up means for observation, the video processor which carries out conversion of the electrical signal of the observation image recorded with above-mentioned usual image-pick-up means for observation to an image signal, fluorescent image-processing means which carries out conversion of the electrical signal of the observation image recorded with above-mentioned fluorescent image-pick-up means for observation to an image signal, synchronous-control means to synchronize above-mentioned illumination light switching means, image-pick-up apparatus switching means, and the usual endoscope image copied out on a monitor and a fluorescent endoscope image, these are comprised.

【発明の詳細な説明】

[DETAILED DESCRIPTION OF INVENTION]

【０００１】

[0001]

【産業上の利用分野】

[INDUSTRIAL APPLICATION]

本発明は、被検部位を照射する通常観察用光源装置及び蛍光観察用光源装置と通常観察用撮像装置及び蛍光観察用撮像装置とを付け換えることなく、通常内視鏡画像と蛍光内視鏡画像とを

This invention relates to the endoscope apparatus which obtains a usual endoscope image and a fluorescent endoscope image, without changing the usual light source device for observation which irradiates an examined region and the fluorescent light source device

得る内視鏡装置に関する。

for observation, the usual image-pick-up apparatus for observation, and the fluorescent image-pick-up apparatus for observation.

【０００２】

[0002]

【従来の技術】
近年、生体からの自家蛍光や生体へ注入した薬物の蛍光を２次元画像として検出し、その蛍光像から生体組織の変性や癌等の疾患状態（例えば、疾患の種類や浸潤範囲）を診断する技術が米国特許４５５６０５７号や５０４２４９４号に示されている。

[PRIOR ART]
In recent years, through the self-fluorescence from the organism, and by using the fluorescence of medicine injected into the organism, it is detected as a two-dimensional image.

The technique whereby illness states (for example, the kind and permeation extent of the illness), such as the modification of an organism tissue and cancer, are diagnosed from the fluorescent image is shown in the U.S. patent of No. 4556057, and No. 5042494.

【０００３】
生体組織に光を照射するとその励起光より長い波長の蛍光が発生する。生体内の蛍光物質としては、例えばＮＡＤＨ（ニコチンアミドアデニンヌクレオチド）やＦＭＮ（フラビンモノヌクレオチド），ピリジンヌクレオチド等があり、最近では、これらの生体内因物質と疾患との相互関係が明確になりつつある。

[0003]
If light is irradiated to an organism tissue, the fluorescence of a wavelength longer than the excitation light will occur.

It uses as a fluorescent material in the living body, for example, there are NADH (nicotinamide adenine nucleotide), FMN (flavin mononucleotide), pyridine nucleotide, etc.

Recently, the interactive relationship of these ?factor-substance? in the living body and illness is becoming clear.

【０００４】
また、ＨｐＤ（ヘマトポルフィリン），Ｐｈｏｔｏｆｒｉｎ，

[0004]
Moreover, fluorescence agents, such as HpD (hematoporphyrin) and Photofrin, ALA((delta)-

ＡＬＡ（δ－ａｍｉｎｏ　ｌｅｖｕｌｉｎｉｃ　ａｃｉｄ）などの蛍光剤は、癌への集積性があり、これら蛍光剤を生体内に注入することによって、蛍光観察を行うことによって疾患部位を診断することができる。

amino levulinic acid), have the accumulation property towards cancer.

By injecting these fluorescence agent in the living body, an illness site can be diagnosed by performing fluorescent observation.

【０００５】

[0005]

【発明が解決しようとする課題】

しかしながら、上述の蛍光観察を内視鏡装置を利用して行う場合、内視鏡装置には通常観察用の光源装置と撮像手段とが配設されているため、蛍光観察を行うためには通常観察用光源装置及び撮像手段を蛍光観察用光源装置及び撮像手段に交換しなければならず、交換の作業が煩わしく、蛍光観察と通常観察とを併用して行うことができなかった。

[PROBLEM ADDRESSED]

However, when the above-mentioned fluorescent observation is performed using an endoscope apparatus, since the light source device and image-pick-up means for a usual observation are arranged by the endoscope apparatus, In order to perform fluorescent observation, the usual light source device for observation and image-pick-up means must be interchanged for the fluorescent light source device for observation, and image-pick-up means, and exchanging them is troublesome.

A fluorescent observation and a fluorescent usual observation were not able to be used together.

【０００６】

本発明は上記事情に鑑みてなされたもので、通常観察用の光源装置及び撮像手段と蛍光観察用の光源装置及び撮像手段とを交換することなく、通常観察及び蛍光観察を選択的に行える内視鏡装置を提供することを目的としている。

[0006]

This invention was made in view of the above-mentioned situation. The light source device for a usual observation, image-pick-up means and the light source device for fluorescent observation, and image-pick-up means are not interchanged.

It aims at providing the endoscope apparatus which can perform selectively usual and

fluorescent observation.

【０００７】

[0007]

【課題を解決するための手段】
本発明の内視鏡装置は、被検部位の内視鏡画像をモニタに写し出して観察する内視鏡装置であって、照明光学系及び観察光学系を内蔵した内視鏡と、通常内視鏡観察を行うための照明光を照射する通常観察用光源装置と、蛍光観察を行うための励起光を照射する蛍光観察用光源装置と、前記通常観察用光源装置及び蛍光観察用光源装置光と照明光学系から延出するライトガイドとを接続する光源用アダプタと、この光源用アダプタに接続された通常観察用光源装置からの照明光と蛍光観察用光源装置からの励起光とを選択的に切換えて前記ライトガイドに導く照明光切換手段と、前記観察用光源装置からの照明光によって照射された被検部位の観察画像を撮像する通常観察用撮像手段と、前記蛍光観察用光源装置からの励起光によって照射された被検部位の観察画像を撮像する蛍光観察用撮像手段と、前記内視鏡の観察光学系で捕らえた被写体像が伝送される接眼部と前記通常観察用撮像手段及び蛍光観察用撮像手段とが接続される

[SOLUTION OF THE INVENTION]
The endoscope apparatus of this invention is an endoscope apparatus which copies out the endoscope image of an examined region on a monitor, and it is observed.
Comprising, the endoscope which built into illumination optical system and the observation optical system, the usual light source device for observation which irradiates the illumination light for performing a usual endoscope observation, the adapter for light sources which connects the fluorescent light source device for observation which irradiates the excitation light for performing fluorescent observation, and the above-mentioned usual light source device for observation and the fluorescent light-source-device light for observation and the light guide extended from an illumination optical system, illumination light switching means whereby the illumination light from the usual light source device for observation connected to this adapter for light sources and the excitation light from the fluorescent light source device for observation are switched selectively, and guided to the above-mentioned light guide, usual image-pick-up means for observation to image-pick up the observation image of the examined region irradiated by the illumination light from the above-mentioned light source device for observation, fluorescent image-pick-up means for observation to image-pick up the

撮像用アダプタと、この撮像用アダプタに接続された接眼部に伝送された被写体像を対応する通常観察用撮像手段、或は、蛍光観察用撮像手段のどちらかに切換え導く撮像手段切換手段と、前記通常観察用撮像手段で撮像した観察画像の電気信号を画像信号に変換するビデオプロセッサと、前記蛍光観察用撮像手段で撮像した観察画像の電気信号を画像信号に変換する蛍光画像処理手段と、前記照明光切換手段と、撮像装置切換手段と、モニタに写し出される通常内視鏡画像及び蛍光内視鏡画像とを同期させる同期制御手段とを具備している。

observation image of the examined region irradiated by the excitation light from the above-mentioned fluorescent light source device for observation,

The adapter for an image pick-up to which the eye-piece part to which the copied object image caught with the observation optical system of the above-mentioned endoscope is transmitted, and above-mentioned usual image-pick-up means for observation, and fluorescent image-pick-up means for observation are connected, usual image-pick-up means for observation to correspond the copied object image transmitted to the eye-piece part connected to this adapter for an image pick-up, or, image-pick-up means switching means switched and guided to one of fluorescent image-pick-up means for observation, the video processor which carries out conversion of the electrical signal of the observation image recorded with above-mentioned usual image-pick-up means for observation to an image signal, fluorescent image-processing means which carries out conversion of the electrical signal of the observation image recorded with above-mentioned fluorescent image-pick-up means for observation to an image signal, and above-mentioned illumination light switching means, image-pick-up apparatus switching means, and synchronous-control means to synchronize the usual endoscope image copied out on a monitor, and a fluorescent endoscope image.

These are comprised.

【０００８】

[0008]

【作用】
この構成によれば、光源用アダプタに通常観察用光源装置と蛍光観察用光源装置とが接続され、撮像用アダプタに通常観察用撮像手段と蛍光観察用撮像手段とが接続されると共に、同期制御手段で接続されることにより、通常観察及び蛍光観察を行う際、光源装置及び撮像手段を交換することなしに通常観察及び蛍光観察を行える。

【０００９】
つまり、通常観察を行う際には同期制御手段を介して通常観察用光源装置と通常観察用撮像手段とビデオプロセッサとが同期し、モニタ画面上に通常内視鏡画像を表示する。

【００１０】
次に、蛍光観察を行う際には同期信号を出力することにより、照明光切換手段と撮像装置切換手段との反射ミラーを駆動して、蛍光観察用光源装置と蛍光観察用撮像手段と蛍光画像処理手段とを同期させ、モニタ画面上に蛍光内視鏡画像を表示する。

[Effect]
According to this composition, the usual light source device for observation and the fluorescent light source device for observation are connected to the adapter for light sources.

While usual image-pick-up means for observation and fluorescent image-pick-up means for observation are connected to the adapter for an image pick-up, it connects with synchronous-control means. Thereby, usual and fluorescent observation can be performed, without interchanging a light source device and image-pick-up means, in case usual and fluorescent observation are performed.

[0009]
In other words, in case a usual observation is performed, the usual light source device for observation, usual image-pick-up means for observation, and a video processor synchronize via synchronous-control means, and the usual endoscope image is displayed on a monitor screen.

[0010]
Next, in case fluorescent observation is performed, the reflective mirror of illumination light switching means and image-pick-up apparatus switching means is actuated by outputting a synchronising signal.

The fluorescent light source device for observation, fluorescent image-pick-up means for observation, and fluorescent image-processing means are synchronized, and the fluorescent endoscope image is displayed on

the monitor screen.

【００１１】

[0011]

【実施例】

以下、図面を参照して本発明の実施例を説明する。図１ないし図５は本発明の一実施例に係り、図１は内視鏡装置の概略構成を示す説明図、図２は回転フィルタの概略を示す説明図、図３は正常部と病変部にレーザ光を照射したときの蛍光感度と波長の関係を示す図、図４はイメージインテンシファイアの概略構成を示す断面図、図５は画像処理装置の概略構成を示すブロック図である。

[Embodiment]

Hereafter, the embodiment of this invention is demonstrated with reference to drawings.

Fig. 1 - 5 concerns one embodiment of this invention.

Diagram 1 is an explanatory drawing showing the schematic composition of an endoscope apparatus.

Diagram 2 is an explanatory drawing showing the outline of a rotating filter.

Diagram 3 is a diagram showing the relationship of the fluorescent sensitivity and the wavelength when irradiating a laser light among a normal part and a disease part.

Diagram 4 is a sectional drawing showing the schematic composition of an image intensifier.

Diagram 5 is a block diagram showing the schematic composition of an image processing device.

【００１２】

本実施例の内視鏡装置は通常観察と蛍光観察とを光源装置及び撮像装置などを交換することなく行えるものであり、内視鏡と、通常観察及び蛍光観察のためのそれぞれの光源装置と、それぞれの光源装置に対応する撮像装置と、それぞれの撮像装置に対応する画像処理装置等から構成されるようになっている。

[0012]

The endoscope apparatus of this embodiment does not interchange usual and fluorescent observation a light source device, an image-pick-up apparatus, etc, and it can carry out.

It is comprised of an endoscope, each light source device for a usual observation and fluorescent observation, the image-pick-up apparatus corresponding to each light source device, the image processing device corresponding to each image-pick-up

apparatus, etc.

【００１３】
図１に示すように内視鏡装置１には挿入部２１の先端に観察光学系２２及び照明光学系２３を配設したオプティカル式内視鏡（以下内視鏡と記載）２と、この内視鏡２の照明光学系２３に照明光を供給する光源装置として、通常観察用にキセノンランプ３１などを備えて通常観察光を供給する通常観察用光源装置３と蛍光観察用に例えば、Ｈｅ－Ｃｄレーザ光を供給する蛍光観察用光源装置４とが備えられている。

[0013]
The optical endoscope 2 which arranged the observation optical system 22 and the illumination optical system 23 to the endoscope apparatus 1 at the end of an insertion part 21 as shown in Diagram 1 (in the following, endoscope), the usual light source device for observation 3 which uses as the light source device which supplies an illumination light to the illumination optical system 23 of this endoscope 2, and supplies a xenon lamp 31 etc. a usual observation light in preparation for the usual object for observation.
The fluorescent light source device for observation 4 which supplies a He-Cd laser light to fluorescent observation, for example.
It has these components.

【００１４】
そして、前記通常観察用光源装置３及び蛍光観察用光源装置４は、リレーレンズ３２やライトガイド４１などの導光路を介して光源用アダプタ５に接続されるようになっている。また、内視鏡２の手元側の把持部２４の側部から延出するユニバーサルコード２５を挿通するライトガイド２６の後端に設けたライトガイドコネクタ２６ａが光源用アダプタ５に接続されている前記光源用アダプタ５の内部には、通常観察用光源装置３からの照明光と蛍光観察用光源装置

[0014]
And, the above-mentioned usual light source device for observation 3 and the fluorescent light source device for observation 4 are connected to the adapter for light sources 5 via light-guide paths, such as the relay lens 32 and the light guide 41.
Moreover, concerning the light guide 26 which passes through the universal cord 25 extended from the side part of the holding part 24 by the side of the hand of an endoscope 2, the illumination light from the usual light source device for observation 3 and the laser light from the fluorescent light source device for observation 4 carry out incidence inside the above-mentioned adapter for light sources 5 by

４からのレーザ光とが入射するようになっており、この２種類の照明光をドライバ６１によって駆動する反射ミラー６２の角度を選択的に切換える照明光切換手段である照明光切換装置６によって、反射ミラー６２の角度を切換えて、照明光を光学レンズ６３を介してライトガイド後端面に導びくようにしている。

which light-guide connector 26a provided on its rear side is connected to the adapter for light sources 5.

The angle of the reflective mirror 62 is switched with the illumination light switching apparatus 6 which is illumination light switching means which switches selectively the angle of the reflective mirror 62 which actuates 2 kinds of this illumination light by driver 61.

It is made to direct the illumination light to a light-guide back side surface via an optical lens 63.

【００１５】

一方、内視鏡２の把持部の後端に配設された接眼部２８には撮像用アダプタ９が接続されると共に、この撮像用アダプタ９には観察用光源装置３からの照明光で照射された被検部位の観察画像を撮像する結像光学系７１及びＣＣＤ７２などを配設した通常観察用撮像手段である通常観察用カメラ７と、蛍光観察用光源装置４からのレーザ光で照射された被検部位の観察画像を撮像する後述する回転フィルタ８１，この回転フィルタを回転させる駆動用モータ８２，後述するイメージインテンシファイア（以下Ｉ．Ｉ．と略記）８３，ＣＣＤ８４などを配設した蛍光観察用撮像手段である蛍光観察用カメラ８とが接続されるようになっている。

[0015]

While the adapter for an image pick-up 9 is connected to the eye-piece part 28 arranged by the rear end of the holding part of an endoscope 2 on the one hand, the usual camera for observation 7 which is usual image-pick-up means for observation which arranged the image-formation optical system 71 which records the observation image of the examined region irradiated with the illumination light from the light source device for observation 3 by this adapter for an image pick-up 9, CCD72, etc., the rotating filter 81 which records the observation image of the examined region irradiated with the laser light from the fluorescent light source device for observation 4 and which is mentioned later, the motor for actuation 82 which rotates this rotating filter, and the fluorescent camera for observation 8 which is fluorescent image-pick-up means for observation which arranged the image intensifier (following I.I. and abbreviation) 83 mentioned later, CCD84, etc. are connected.

【００１６】
前記撮像用アダプタ９にはこの撮像用アダプタ９に接続される接眼部２８に伝送された被写体像を通常観察用カメラ７、或は、蛍光観察用カメラ８に切換え導く撮像手段切換手段である撮像切換装置１０が配設されている。この撮像切換装置１０は、ドライバ１０１と、このドライバ１０１によって駆動する反射ミラー１０２とから構成されている。

[0016]
The image-pick-up switching apparatus 10 which is image-pick-up means switching means to switch and guide the copied object image transmitted to the eye-piece part 28 connected to this adapter for an image pick-up 9 to the usual camera for observation 7 or the fluorescent camera for observation 8 is arranged by the above-mentioned adapter for an image pick-up 9.

This image-pick-up switching apparatus 10 consists of driver 101 and the reflective mirror 102 actuated by this driver 101.

【００１７】
そして、前記通常観察用カメラ７にはＣＣＤ７２に撮像した被写体像の電気信号を画像信号に変換するビデオプロセッサ１１が接続される一方、前記蛍光観察用カメラ８のＣＣＤ８４に撮像した被写体像の電気信号を画像信号に変換する後述する画像処理装置１２１及びタイミングコントローラ１２２などを配設した蛍光画像処理手段である蛍光画像処理装置１２が接続され、ビデオスイッチャ１３１を介してモニタ１４に被写体像が写し出されるようになっている。

[0017]
And, while the video processor 11 which carries out conversion of the electrical signal of the copied object image recorded to CCD72 to an image signal is connected to the above-mentioned usual camera for observation 7, the fluorescent image processing device 12 which is fluorescent image-processing means which arranged the image processing device 121, the timing controller 122, etc. which carry out conversion of the electrical signal of the copied object image recorded by CCD84 of the above-mentioned fluorescent camera for observation 8 to an image signal, and which are mentioned later is connected.

The copied object image is copied out to monitor 14 via the video switcher 131.

【００１８】
このとき、前記照明光切換装置６，撮像切換装置１０，モニタ

[0018]
For the video switcher 131 which switches the usual endoscope image copied out on the

１４に写し出される通常内視鏡画像及び蛍光内視鏡画像を切換えるビデオスイッチャ１３１は、タイミングコントローラ１３２を備えた同期制御手段である同期制御装置１３によって同期制御されている。なお、符号１５は、切換えスイッチであり同期制御装置１３のタイミングコントローラ１３２に接続されたフットスイッチである。前記タイミングコントローラ１３２を介してドライバ６１，１０１に接続され、照明光切換装置６の反射ミラー６２及び撮像切換装置１０の反射ミラー１０２を通常観察状態、或は、蛍光観察状態に同期して切換えると共に、モニタ画面上に写し出される内視鏡画像をビデオスイッチャ１３１を介して切換えるようになっている。切換スイッチは、フットスイッチに限定されるものではなく、手元側スイッチを用いても良いことはいうまでもない。

above-mentioned illumination light switching apparatus 6, the image-pick-up switching apparatus 10, and monitor 14, and a fluorescent endoscope image at this time, synchronous control is carried out with the synchronous-control apparatus 13 which is synchronous-control means equipped with the timing controller 132.

In addition, symbol 15 indicates a change switch and is the foot switch connected to the timing controller 132 of the synchronous-control apparatus 13.

It connects with drivers 61 and 101 via the above-mentioned timing controller 132.

While switching the reflective mirror 62 of the illumination light switching apparatus 6, and the reflective mirror 102 of the image-pick-up switching apparatus 10 synchronizing with a usual observation state or fluorescent observation state, the endoscope image copied out on a monitor screen is switched via the video switcher 131.

It goes without saying that the change-over switch is not limited to a foot switch, and a front side switch may be used.

【００１９】

また、本図においては蛍光観察用光源装置４と光源用アダプタ５とはライトガイド４１の先端部を差し込むことによって接続され、前記撮像用アダプタ９と通常観察用カメラ７及び蛍光観察用カメラ８とは図示しないネジロック、鍵ロック等によって

[0019]

Moreover, in this figure, the fluorescent light source device for observation 4 and the adapter for light sources 5 are connected by inserting the end of a light guide 41.

The above-mentioned adapter for an image pick-up 9, the usual camera for observation 7, and the fluorescent camera for observation 8 are connected by one-touch with the screw lock

ワンタッチで接続されるようになっている。

not illustrated, a key lock, etc.

【００２０】
さらに、図２に示すように蛍光観察用カメラ８に配設される回転フィルタ８１には、４８０～５２０ｎｍ帯域用の第１のフィルタ８１ａと６３０ｎｍ以上の帯域用の第２フィルタ８１ｂとが配設されている。このことにより、蛍光観察用光源装置４からＨｅ－Ｃｄレーザによる紫色光４４２ｎｍをライトガイド１６に導光し生体を照射して蛍光画像を観察する場合、組織からは前記Ｈｅ－Ｃｄレーザによる紫色光４４２ｎｍより長い波長の自家蛍光が発生するので、この蛍光を蛍光観察用カメラ８に配設されている回転フィルタ８１の第１のフィルタ８１ａと第２のフィルタ８１ｂとで順次撮像して蛍光内視鏡画像を得るようにしている。なお、図３に示すように前記紫色光の励起光で得られる可視領域の蛍光感度は、正常部位では強く、癌などの病変部では弱くなり、特に、λ１に示す４８０～５２０ｎｍ帯域では蛍光強度がかなり強くなることが知られている。

[0020]
Furthermore, first filter 81a for 480 - 520 nm bands and second filter 81b for bands 630 nm or more are arranged by the rotating filter 81 arranged by the fluorescent camera for observation 8 as shown in Diagram 2.
When the light-guide of the 442 nm violet light by the He-Cd laser is carried out to a light guide 16 from the fluorescent light source device for observation 4, the organism is irradiated and a fluorescent image is observed accordingly, since the self-fluorescence of a wavelength longer than 442 nm violet light by the above-mentioned He-Cd laser occurs from a tissue, this fluorescence is sequentially recorded by first filter 81a and 2nd filter 81b of the rotating filter 81 which are arranged by the fluorescent camera for observation 8, and it is made to obtain a fluorescent endoscope image.

In addition, the fluorescent sensitivity of the visualisation area obtained by the excitation light of the above-mentioned purple light as shown in Diagram 3 is strong at a normal region.

In disease parts, such as cancer, it becomes weak.

It is known in 480 - 520 nm bands especially shown in (lambda)1 that a fluorescence intensity will become quite strong.

【００２１】
図４に示すように蛍光観察用カメラ８に配設されているＩ．Ｉ．

[0021]
I.I.83 currently arranged by the fluorescent camera for observation 8 as shown in Diagram

８３は、前記回転フィルタ８１の第１のフィルタ８１ａ及び第２のフィルタ８１ｂを透過した微弱な蛍光内視鏡画像を増強するためのものであり、ファイバプレート８３ａの光電面８３ｂに結ばれた光学像を一度電子像に変換し、マイクロチャンネルプレート（以下ＭＭＣと略記）８３ｃを通過させることによって電子倍増を行い、蛍光面８４ｄに入射させて再び光学像に変換するものである。このＩ．Ｉ．８３によって電子増強された蛍光内視鏡画像は結像レンズ８４ｅを介してＣＣＤ８４に結像されている。

4 are for reinforcing the slight fluorescent endoscope image which passed through first filter 81a and 2nd filter 81b of the above-mentioned rotating filter 81.
conversion of the optical image connected to photocathode 83b of fibre plate 83a is applied to an electronic image once.
Electronic redoubling is performed by passing through micro-channel-plate (following MMC and abbreviation) 83c.

It incidents 84d fluroescent screen, and conversion is again carried out to an optical image.

The fluorescent endoscope image by which electronic reinforcement was carried out is image-formed by this I.I.83 via image-formation lens 84e at CCD84.

【００２２】

図５に示すように画像処理装置１２１は、マルチプレクサ１２１ａ，フレームメモリλ１１２１ｂ，フレームメモリλ２１２１ｃ、演算回路１２１ｄ及びデジタルアナログ変換器１２１ｅなどで構成されており、前記蛍光観察用カメラ８に配設した回転フィルタ８１の第１のフィルタ８１ａ及び第２のフィルタ８１ｂを透過して前記Ｉ．Ｉ．８３によって電子増強されて結像レンズ８４ｅを介してＣＣＤ８４に結像した内視鏡画像のノイズ分をキャンセルして増幅する画像信号処理部８４ａ及びアナログデジタル変換器８４ｂによ

[0022]

As shown in Diagram 5, the image processing device 121 consists of multiplexer 121a, frame-memory (lambda) 1121b, frame-memory (lambda)2 121c, 121d calculation circuit, digital-analog converter 121 e, etc.
First filter 81a and 2nd filter 81b of the rotating filter 81 which were arranged to the above-mentioned fluorescent camera for observation 8 are passed through.
The noise part of the endoscope image which electronic reinforcement is carried out by the above-mentioned I.I. 83, and was image-formed to CCD84 via image-formation lens 84e is canceled.
With the digital data formed by image-signal processor 84a and analog digital converter 84b to amplify, via multiplexer 121, it is split into

って生成されたデジタルデータをマルチプレクサ１２１を介してフレームメモリλ１１２１ｂ及び フレームメモリλ２１２１ｃに分離し、演算回路１２１ｄで第１のフィルタ８１ａより得られた画像信号と第２のフィルタ８１ｂより得られた画像信号の差或は比などを求め、デジタルアナログ変換器１２１ｅを介してビデオスイッチャ１３１に映像信号が出力されるようになっている。なお、回転フィルタ８１の第１のフィルタ８１ａと第２のフィルタ８１ｂとで得られる画像の読み出しのタイミングは、第１のフィルタと第２のフィルタとの切換えのタイミングに同期している。

frame-memory (lambda) 1121b and frame-memory (lambda)2 121c.
It asks for the difference or the ratio of the image signal obtained from first filter 81a in 121d calculation circuit, and the image signal obtained from 2nd filter 81b etc.

The video signal outputs to the video switcher 131 via digital analog converter 121e.

In addition, for the timing of a reading of the image obtained by first filter 81a and 2nd filter 81b of the rotating filter 81, it synchronizes with the timing of switching between the 1st and 2nd filters.

【００２３】
上述のように構成されている内視鏡装置１の作用を説明する。図１に示すようにモニタ１４に通常内視鏡画像を表示する際には、光源用アダプタ５に内設されている撮像用アダプタ９に内設されている照明光切換装置６及び撮像切換装置１０の反射ミラー６２及び反射ミラー１０２が光軸に対して略４５度に傾いて配設されると共に、通常観察用カメラ７に接続されているビデオプロセッサ１１で変換した映像信号がモニタ１４に表示されるようにビデオスイッチャ１

[0023]
An effect of the endoscope apparatus 1 constituted as mentioned above is demonstrated.
As shown in Diagram 1, when displaying a usual endoscope image to monitor 14, in relation to the illumination light switching apparatus 6 currently provided internally to the adapter for an image pick-up 9 currently provided internally to the adapter for light sources 5, the reflective mirror 62 of the image-pick-up switching apparatus 10, and the reflective mirror 102 receive an optical axis, it is arranged inclined roughly 45 degrees.

The video switcher 131 has switched so that the video signal transformed by the video

３１が切り換わっている。

processor 11 connected to the usual camera for observation 7 may be displayed by monitor 14.

【００２４】
すなわち、通常観察用光源装置３から出射される照明光は反射ミラー６２で反射しライトガイド２６に導かれて照明光学系２３を介して被検部位を照射する。この通常観察用光源装置３から出射された照明光によって照射された被検部位の被写体像は、接眼部２８を介して撮像用アダプタ９に入射し、反射ミラー１０２で反射し、通常観察用カメラ７に導かれる。この通常観察用カメラ７に導かれた被写体像は、結像レンズ７１を介してＣＣＤ７２に結像され、電気信号に変換され、ビデオプロセッサ１１で変換した撮像信号をビデオスイッチャ１３１を介してモニタ１４に通常内視鏡画像として表示する。

[0024]
That is, the illumination light by which a radiation is carried out from the usual light source device for observation 3 is reflected by the reflective mirror 62. It guides to a light guide 26 and the examined region is irradiated via the illumination optical system 23.
Incidence of the copied object image of the examined region irradiated by the illumination light by which the radiation was carried out is carried out to the adapter for an image pick-up 9 via the eye-piece part 28 from this usual light source device for observation 3, it reflects by the reflective mirror 102, and it guides to the usual camera for observation 7.
The copied object image guided to this usual camera for observation 7 is image-formed by CCD72 via the image-formation lens 71.
conversion is carried out to an electrical signal, and the image-pick-up signal transformed by the video processor 11 is displayed as a usual endoscope image on monitor 14 via the video switcher 131.

【００２５】
次に、蛍光内視鏡画像をモニタ１４に表示する際は、まず、フットスイッチ１５を踏むことによって、通常観察状態から蛍光観察状態に移行するための切換え信号を出力する。すると、フットスイッチ１５から出力された切換え信号は、タイミングコ

[0025]
Next, in case a fluorescent endoscope image is displayed in monitor 14, the change signal for carrying out transfer to fluorescent observation state is first output from a usual observation state by stepping on foot switch 15.
Then, while the change signal output from the foot switch 15 will be input into the timing controller 132, it switches to driver 61 of the

ントローラ１３２に入力される一方、このタイミングコントローラ１３２から光源用アダプタアダプタ５に内設されている照明光切換装置６のドライバ６１，撮像用アダプタ９に内設されている撮像切換装置１０のドライバ１０２及びビデオスイッチャ１３１に切換え信号が出力される。このことにより、反射ミラー６２及び反射ミラー１０２が光軸に対して平行な状態に切り換えられると共に、蛍光画像処理装置１２からの撮像信号がモニタ１４に表示されるようにビデオスイッチャ１３１が切り換わる。

illumination light switching apparatus 6 currently provided internally to the adapter adapter [sic] for light sources 5, driver 102 of the image-pick-up switching apparatus 10 currently provided internally to the adapter for an image pick-up 9, and the video switcher 131 from this timing controller 132, and a signal is output.

Thereby, while the reflective mirror 62 and the reflective mirror 102 are switched to a parallel state to an optical axis, the video switcher 131 switches so that the image-pick-up signal from the fluorescent image processing device 12 may be displayed by monitor 14.

【００２６】
すなわち、通常観察用光源装置３から出射されている照明光は反射ミラー６２で反射され、蛍光観察用光源装置４から出射されているＨｅ－Ｃｄレーザによる紫色光４４２ｎｍがライトガイド２６に導かれて照明光学系２３を介して被検部位を照射する。この蛍光観察用光源装置４から出射されたレーザ光によって照射された被検部位の被写体像は、接眼部２８を介して撮像用アダプタ９に入射し、光学レンズ１０３を透過して蛍光観察用カメラ８に導かれる。この蛍光観察用カメラ８に導かれた被写体像は、モータ８２で回転す

[0026]
That is, the illumination light by which the radiation is carried out from the usual light source device for observation 3 is reflected by the reflective mirror 62.

442 nm violet light by the He-Cd laser by which the radiation is carried out is guided to a light guide 26 from the fluorescent light source device for observation 4, and an examined region is irradiated via the illumination optical system 23.

Incidence of the copied object image of the examined region irradiated by the laser light by which the radiation was carried out is carried out to the adapter for an image pick-up 9 via the eye-piece part 28 from this fluorescent light source device for observation 4.

An optical lens 103 is passed through and it

る回転フィルタ８１に配設されている第１のフィルタ８１ａ及び第２のフィルタ８１ｂを通過してＩ．Ｉ．８３で電子倍増されてＣＣＤ８４に結像され、電気信号に変換され、蛍光画像処理装置１２でこの電気信号を撮像信号に変換されてビデオスイッチャ１３１を介してモニタ１４に蛍光内視鏡画像が表示される。

guides to the fluorescent camera for observation 8.
The copied object image guided to this fluorescent camera for observation 8 passes first filter 81a and 2nd filter 81b which are arranged by the rotating filter 81 rotated by motor 82, and electronic redoubling is carried out by I.I.83, and it is image-formed by CCD84. conversion is carried out to an electrical signal, and conversion of this electrical signal is carried out to an image-pick-up signal by the fluorescent image processing device 12, and a fluorescent endoscope image is displayed by monitor 14 via the video switcher 131.

【００２７】
なお、蛍光観察に引き続き、通常観察を行う場合には、フットスイッチ１５を踏んで切換え信号を出力することにより、蛍光観察状態であった反射ミラー６２及び反射ミラー１０２を光軸に対して略４５度に傾くように切換えると共に、通常観察用カメラ７に接続されているビデオプロセッサ１１からの映像信号がモニタ１５に表示されるようにビデオスイッチャ１３１が切り換わる。符号８５は光学レンズである。

[0027]
In addition, after fluorescent observation, while switching the reflective mirror 62 and the reflective mirror 102 which were in the fluorescent observation state by stepping on and switching foot switch 15 and outputting a signal so that it may incline to roughly 45 degrees in relation to the optical axis in performing a usual observation, the video switcher 131 switches so that the video signal from the video processor 11 connected to the usual camera for observation 7 may be displayed by monitor 15.
Symbol 85 is an optical lens.

【００２８】
このように、内視鏡装置に内視鏡と、通常観察用の通常観察用光源装置及び通常観察用カメラ及びビデオプロセッサと、蛍光

[0028]
While providing for an endoscope apparatus with an endoscope, the usual light source device for observation for a usual observation, the usual camera for observation and a video

観察用の蛍光観察用光源装置及び蛍光観察用カメラ及び蛍光画像処理装置と設けると共に、前記通常観察用光源装置と蛍光観察用光源装置とを光源用アダプタに一体的に接続し、前記通常観察用カメラと蛍光観察用カメラとを撮像用アダプタに一体的に接続して、切換スイッチを備えた同期制御装置で同期制御することによって光源装置や撮像装置などの交換をすることなく、切換スイッチ一つで通常観察及び蛍光観察を行うことができる。

processor, and the fluorescent light source device for observation for fluorescent observation, the camera for fluorescent observation and a fluorescent image processing device in this way, the above-mentioned usual light source device for observation and the fluorescent light source device for observation are integrally connected to the adapter for light sources.

The above-mentioned usual camera for observation and the fluorescent camera for observation are integrally connected to the adapter for an image pick-up.

exchange, such as of a light source device and an image-pick-up apparatus, is not carried out by carrying out synchronous control with the synchronous-control apparatus equipped with the change-over switch, and a usual observation and a usual fluorescent observation can be performed by one change-over switch.

【００２９】

図６及び図７は本発明の第２実施例に係る内視鏡装置の概略構成を示す説明図である。図６に示すように本実施例では蛍光内視鏡画像と通常内視鏡画像とを同一モニタ上に表示するものであり、前記同期制御装置１３のビデオスイッチャ１３１の代わりにスーパーインポーズ１３３の機能を制御装置１３′に設けている。このことにより、フットスイッチ１５から切換え信号がタイミングコントローラ１３

[0029]

Fig. 6 and 7 is an explanatory drawing showing the schematic composition of the endoscope apparatus based on the second embodiment of this invention.

As shown in Diagram 6, in this embodiment, a fluorescent endoscope image and a usual endoscope image are displayed on the same monitor.

Function of superimposition 133 is provided on control-apparatus 13' instead of the video switcher 131 of the above-mentioned synchronous-control apparatus 13.

Thereby, if a change signal is input into the

２に入力されると、モニタ１４の画面の通常内視鏡画像上に蛍光内視鏡画像をスーパーインポーズすることができる。その他の構成及び作用・効果は前記実施例と同様であり、同部材には同符号を付して説明を省略する。

timing controller 132 from a foot switch 15, a fluorescent endoscope image can be superimposed on the usual endoscope image of the monitor screen 14.

Other composition and effects are the same as the above-mentioned embodiment.

The same symbol is attached to the said member and description is omitted.

【００３０】
なお、蛍光内視鏡画像と通常内視鏡画像の両方を同時に、且つ、リアルタイムにモニタ１４上に表示するため、照明光切換装置６及び撮像切換装置１０のドライバ６１，１０１による反射ミラー６２，１０２の切換えタイミングを１／６０～１ｓ程度の高速に行なっている。

[0030]
In addition, in order to display both fluorescent endoscope image and usual endoscope image on monitor 14 simultaneously and in real-time, switch timing of the reflective mirrors 62 and 102 by drivers 61 and 101 of the illumination light switching apparatus 6 and the image-pick-up switching apparatus 10 is performed at the high speed about 1/60 - 1s.

【００３１】
なお、画像の蓄積及び読み出しは図７に示すように例えば反射ミラーが１／３０ｓで切換えられているとすると、１／３０ｓ毎に以下の２つの動作を繰り返すようになっている。１つは撮像用アダプタ９に接続されている通常観察用カメラ７（図中第１のカメラと記載）に内視鏡画像が１／３０ｓの間入射し、この１／３０ｓの間に内視鏡画像の蓄積及び読み出しを行う。もう１つは撮像用アダプタ９に接続されている蛍光観察用カメラ７（図中第２のカメラと記載）

[0031]
In addition, the storage of an image and a reading will repeat the following two operations every 1/30s, supposing the reflective mirror is switched at 1/30s, as shown in Diagram 7.
One is to the usual camera for observation 7 (it is described as the first camera in the drawing(s)) connected to the adapter for an image pick-up 9. for 1/30s the endoscope image incidents.

The storage of an endoscope image and a reading are performed for 1/30s.

Another is the fluorescent camera for observation 7 (it is described as the 2nd camera in the drawing(s)) connected to the adapter for an image pick-up 9. the endoscope image

に内視鏡画像が１／３０ｓの間入射する。このとき、蛍光観察用カメラ８には第１のフィルタ８１ａ及び第２のフィルタ８１ｂを配設した回転フィルタ８１が１／３０ｓの回転速度で回転しているので、蛍光観察用カメラ８には１／６０ｓ毎に第１のフィルタ８１ａ及び第２のフィルタ８１ｂを透過した内視鏡画像が入射する。そして、この１／６０ｓの間に第１のフィルタ８１ａ及び第２のフィルタ８１ｂを透過したそれぞれの内視鏡画像の蓄積及び読み出しを行う。

incidents for 1/30s.
The rotating filter 81 which arranged first filter 81a and 2nd filter 81b to the fluorescent camera for observation 8 at this time, since it is rotating with at 1/30s rotational speed

The endoscope image which passed through first filter 81a and 2nd filter 81b every 1/60s incidents to the fluorescent camera for observation 8.

And, the storage of each endoscope image and a reading which passed through first filter 81a and 2nd filter 81b are carried out for 1/60s.

【００３２】
ところで、前記照明光切換装置６及び撮像切換装置１０のドライバ６１，１０１によって反射ミラー６２，１０２の切換えタイミングを高速に行なうとき、微弱な蛍光像を撮像する極めて高感度な蛍光観察用カメラ８に通常観察用光源装置３の照明光が入射して焼き付けを起こす虞れがある。そこで、反射ミラー１０２の切換えタイミングを以下のようにすることによって通常観察用光源装置３の照明光の蛍光観察用カメラ８への入射を無くして蛍光観察用カメラ８の焼き付けを防止している。

[0032]
When drivers 61 and 101 of the above-mentioned illumination light switching apparatus 6 and the image-pick-up switching apparatus 10, by the way, perform change timing of the reflective mirrors 62 and 102 at high speed, the illumination light of the usual light source device for observation 3 incidents to the extremely sensitive camera for fluorescent observation 8 which records a slight fluorescent image, and there is a possibility that burning it may be caused.

Then, by making the change timing of the reflective mirror 102 the following, the incidence to the fluorescent camera for observation 8 of the illumination light of the usual light source device for observation 3 is eliminated, and burning of the fluorescent camera for observation 8 is prevented.

【００３３】
すなわち、図８に示すように反射ミラー６２の切換えによって通常観察用光源装置３の照明光（図中第１の光源と記載）の蛍光観察用光源装置４のレーザ光（図中第２の光源と記載）とが同じ周期で出射されている。そして、通常観察用光源装置３の照明光に対応する通常観察用カメラ７（図中第１のカメラ）へ入射する時間を通常観察用光源装置３の照明光が出射される時間よりも前後でｔ１秒づつ伸ばしている。

[0033]
That is, as shown in Diagram 8, by change of the reflective mirror 62, the radiation of the laser light (it is described as a 2nd light source in the drawing(s)) of the fluorescent light source device for observation 4 of the illumination light (it is described as a first light source in the drawing(s)) of the usual light source device for observation 3 is carried out in the same cycle period.

And, the illumination light of the usual light source device for observation 3 is lengthening roughly t1 seconds the time which incidents to the usual camera for observation 7 (in the drawing(s) first camera) corresponding to the illumination light of the usual light source device for observation 3, more than the time in which radiation is carried out.

【００３４】
このことにより、第１の光源から第２の光源に切り換わったｔ１秒後に蛍光観察用カメラ８（図中第２のカメラ）側に反射ミラー１０２が切り換え、第２の光源から第１の光源に切り換わるｔ１秒前に第１のカメラ側に反射ミラー１０２が切り換えて通常観察用光源装置３の照明光の蛍光観察用カメラ８への入射を無くして蛍光観察用カメラ８の焼き付けを防止することができる。

[0034]
By this, the reflective mirror 102 switches to the fluorescent camera 8 (in the drawing(s) 2nd camera) side for observation in t1 seconds which switched from the first light source to the 2nd light source.

The reflective mirror 102 can switch to a first camera side before t1 second which switches from a 2nd light source to a first light source, the incidence to the fluorescent camera for observation 8 of the illumination light of the usual light source device for observation 3 can be eliminated, and burning of the fluorescent camera for observation 8 can be prevented.

【００３５】

[0035]

なお、第１のカメラの画像蓄積及び転送は光源の周期で行われ、第２のカメラへの画像蓄積及び転送は上述のタイミングで行われている。

In addition, image storage of a first camera and transmission are performed during the cycle period of the light source, and image storage to a 2nd camera and transmission are performed at the above-mentioned timing.

【００３６】
また、照明光切換装置６及び撮像切換装置１０のドライバ６１，１０１によって反射ミラー６２，１０２を高速に切換えていたのでは長期間の使用に耐えることができない。そこで、切換装置の切換手段を以下のように構成することによって高速の切換えを容易に行えるようにしている。

[0036]
Moreover, by having switched the reflective mirrors 62 and 102 at high speed by drivers 61 and 101 of the illumination light switching apparatus 6 and the image-pick-up switching apparatus 10, it cannot endure extended usage.

Then, it enables it to perform a high-speed change easily by constituting switching means of the switching apparatus as follows.

【００３７】
図９に示すように本実施例では切換装置をドライバと反射ミラーとの組み合わせで構成する代わりに画像経路変換装置１６を光軸に対して略４５度の傾きに配設している。前記画像経路変換装置１６は、回転板１６１に画像経路変換手段として透孔１６１ａとミラー１６１ｂを形成し、モータ１６２で回転板１６１を所定の回転速度で回転させるものであり、モータ１６２により回転板１６１が回転する構造となっていることにより高速切換えが可能となる。

[0037]
As shown in Diagram 9, in this embodiment, the image path converter 16 is arranged inclined roughly 45 degrees to an optical axis instead of constituting a switching apparatus from the combination of a driver and a reflective mirror. The above-mentioned image path converter 16 forms through-hole 161a and mirror 161b on the rotation board 161 as image path conversion means.

The rotation board 161 is rotated at a predetermined rotational speed by motor 162.

High-speed change can be performed by having the structure whereby the rotation board 161 rotates by motor 162.

【００３８】

[0038]

ところで、反射ミラーの切換えタイミングを高速で行なう以外にも撮像用アダプタに外来光などが入射して、高感度な蛍光観察用カメラに焼き付けを起こす虞れがある。そこで、以下のように撮像用アダプタを構成することによって外来光など所定の波長以下の光が撮像用アダプタを介して蛍光用カメラへ入射することを防止している。

Except for, by the way, performing change timing of a reflective mirror at high speed, extraneous light etc. incidents to the adapter for an image pick-up.

There is possibility that burning may be caused in the fluorescent high sensitivity camera for observation.

Then, it has prevented that the lights below a predetermined wavelength, such as extraneous light, carry out incidence to the camera for fluorescence via the adapter for an image pick-up by constituting the adapter for an image pick-up as follows.

【００３９】

図１０に示すように入射防止手段１７は、まず、撮像用アダプタ９に入射した光をビームスプリッタ１７１を通し受光器１７２で検出する。そして、この受光器１７２の前に設けられたカットフィルタ１７２ａにより、蛍光観察用光源装置４から出射されるレーザ光の波長以下の光をカットする。すなわち、図１１に示すように通常観察用光源装置からの照明光が規則的に入射する際（１）や、外来光が突発的に入射した際（２）或は取り外しの際（３）外光が入射して受光器１７２に光が届いたとき、信号をドライバ１０１に出力して強制的にミラー１０２をＡ側に駆動させて蛍光観察用カメラへの光の入射を防ぐことができる。

[0039]

As shown in Diagram 10, first, incidence prevention means 17 passes through a beam splitter 171 to the adapter for an image pick-up 9, and detects incident light by the light receiver 172.

And, the light below the wavelength of the laser light by which a radiation is carried out is cut from the fluorescent light source device for observation 4 by cut filter 172a provided before this light receiver 172.

Namely, as shown in Diagram 11, when the illumination light from the usual light source device for observation carries out incidence regularly (1), when extraneous light is suddenly incidented (2), or when the light outside (3) carries out incidence at the time of removal and light reaches the light receiver 172, a signal is output to driver 101 and mirror 102 is made to move to A side forcibly, and the incidence of the light to the fluorescent camera for observation can be prevented.

【００４０】
また、上述の光学的手段に加え、接眼部２８に接続されていること検知するスイッチ１７４を設け、接眼部２８からの着脱の際の焼き付きを防止する機能を付けることでより安全となる。すなわち、取り外したとき、強制的にドライバ１０１を駆動させてミラー１０２を傾け蛍光観察用カメラへの光の入射を防ぐようになっている。

[0040]
Moreover, in addition to above-mentioned optical means, switch 174 which is connected to the eye-piece part 28 and which carries out detection is provided.

It becomes safer by having the ability to prevent the seizure in the case of the insertion or removal from the eye-piece part 28.

Namely, at the time of removed, driver 101 is made to actuate forcibly, mirror 102 is inclined, and the incidence of the light to the fluorescent camera for observation is prevented.

【００４１】
さらに、図１２に示すように蛍光観察用カメラ８を撮像用アダプタ９に着脱する際にもにＩ．Ｉ．８３に外来光などが入射して、高感度な蛍光観察用カメラ８に焼き付けを起こす虞れがある。そこで、蛍光観察用カメラ８が撮像用アダプタ９に接続されていること検知する検知手段１８としてスイッチ１８２を設けている。すなわち、蛍光観察用カメラ８が撮像用アダプタ９から取り外されることによってスイッチ１８２が切られることにより、Ｉ．Ｉ．８３への電源の供給が停止してシャッタが閉じるようになっている。符号１８１は高圧電源を示している。

[0041]
Furthermore, as shown in diagram 12, in case the fluorescent camera for observation 8 is insert or removed from the adapter for an image pick-up 9, extraneous light etc. incidents to I.I.83.

There is the possibility that burning may be caused for the fluorescent high sensitivity camera for observation 8.

Then, switch 182 is provided as detection means 18 which carries out detection in the case whereby fluorescent camera for observation 8 is connected to the adapter for an image pick-up 9.

That is, by removing the fluorescent camera for observation 8 from the adapter for an image pick-up 9, by turning off switch 182, supply of the power of I.I.83 carries out a stoppage, and the shutter closes.

Symbol 181 shows the high voltage power supply.

【００４２】
ところで、蛍光観察を行うために蛍光観察用カメラを内視鏡の接眼部に直接接続していたため、蛍光観察用カメラが清潔域に位置することになるので、術後、蛍光観察用カメラを滅菌しなければならなかった。しかしながら、大型の蛍光観察用カメラを滅菌する作業は難しくとても煩わしい作業であった。そこで、内視鏡装置を以下のように構成することによって蛍光観察用カメラを清潔域以外に配設して術後の滅菌作業を無くすようにしている。

[0042]
Since the fluorescent camera for observation was directly connected to the eye-piece part of an endoscope in order to perform fluorescent observation by the way, and the fluorescent camera for observation would be positioned in a clean [sic] region, after the operation the fluorescent camera for observation had to be sterilized.

However, work which sterilizes the fluorescent large-sized camera for observation was hard and very troublesome work.

Then, the fluorescent camera for observation is arranged outside of the clean [sic] region, and it is made to eliminate postoperative sterilization work by constituting an endoscope apparatus as follows.

【００４３】
図１３に示すように内視鏡２に撮像用アダプタ９を接続し、この撮像用アダプタ９と蛍光観察用カメラ８とをイメージガイド９１を内蔵したフレキシブルケーブル９１′で接続している。このように、撮像用アダプタと蛍光観察用カメラとをイメージガイドを内蔵したフレキシブルケーブル′で接続することにより、大型の蛍光観察用カメラを清潔域外に配設して術後の滅菌作業を無くすことができると共に、蛍光観察用カメラの操作性が向上する。その他の構成及び作用・効果は前記実施例と同様であり、同部材には同符号を付

[0043]
As shown in Diagram 13, the adapter for an image pick-up 9 is connected to an endoscope 2.

This adapter for an image pick-up 9 and the fluorescent camera for observation 8 are connected by flexible cable 91' which was built into image guide 91.

Thus, while the fluorescent large-sized camera for observation can be arranged outside of a clean region and postoperative sterilization work can be eliminated by connecting the adapter for an image pick-up, and the fluorescent camera for observation by flexible cable ' which was built into image guide, the operativity of the fluorescent camera for observation improves.

Other composition and effects are the same

して説明を省略する。

as the above-mentioned embodiment.

The same symbol is given to the same member and description is omitted.

【００４４】

ところで、前記第１実施例及び第２実施例或は前記図１３に示した内視鏡装置では、同期制御装置で同期制御することによって光源装置や撮像装置などの交換をすることなく、切換スイッチ一つで通常観察及び蛍光観察を行うことができるようになっていた。本実施例では内視鏡装置の光源用アダプタを以下のように構成することによって光源装置や撮像装置などの交換をすることなく、通常観察及び蛍光観察を行うことができるようになっている。なお、本実施例においては前記第２実施例と同様にスーパーインポーズによって、蛍光内視鏡画像がモニタ上に表示されるようになっている。

[0044]

In the endoscope apparatus shown in the 1st above-mentioned embodiment and a second embodiment, or the above-mentioned diagram 13 by the way, exchange, such as of a light source device and an image-pick-up apparatus, is not carried out by synchronously controlling via the synchronous-control apparatus, and the usual and fluorescent observation can be performed now by one change-over switch.

exchange, such as of a light source device and an image-pick-up apparatus, is not carried out by constituting as follows the adapter for light sources of an endoscope apparatus according to this embodiment.

A usual observation and a usual fluorescent observation can be performed now.

In addition, in this embodiment, a fluorescent endoscope image displays on a monitor by superimposition like the above-mentioned second embodiment.

【００４５】

図１４に示すように本実施例においては、光源用アダプタ１８をドライバ１８１と反射ミラー１８４で形成された照明光切換装置１８５を配設すると共に、タイミングコントローラ１８２及びスーパーインポーズ回路１８３を配設して構成している。そして、この光源用アダプタ１

[0045]

As shown in Diagram 14, while arranging the illumination light switching apparatus 185 formed by driver 181 and the reflective mirror 184 in the adapter for light sources 18 in this embodiment, the timing controller 182 and the superimposition circuit 183 are arranged and constituted.

And, the usual observation light source device 3 connects with this adapter for light

８に通常観察光源装置３がライトガイド３２を内蔵したコード３２′で接続されるようになっている。

sources 18 by cord 32' which was built into light guide 32.

【００４６】
また、前記タイミングコントローラ１８２は、照明光切換装置１８′のドライバ１８１及び撮像切換装置１０のドライバ１０１とスーパーインポーズ回路１８３とに切換え信号を出力して同期制御するものであるが、本実施例においては、スーパーインポーズ回路１８３及びドライバ１８１が光源用アダプタ内に配設されると共に、撮像切換装置１０のドライバ１０１とタイミングコントローラ１８２とを接続する接続線２９が内視鏡２のユニバーサルコード内を挿通するように構成されている。このため、同期制御のための信号ケーブルを新たに設ける必要が無くなる。その他の構成及び作用・効果は前記実施例と同様であり、同部材には同符号を付して説明を省略する。

[0046]
Moreover, the above-mentioned timing controller 182 is switched to driver 181 of illumination light switching apparatus 18' and driver 101 of the image-pick-up switching apparatus 10, and the superimposition circuit 183, and outputs and carries out synchronous control of the signal.
However, in this embodiment, while the superimposition circuit 183 and driver 181 are arranged in the adapter for light sources, it is constituted so that the connection line 29 which connects driver 101 and the timing controller 182 of the image-pick-up switching apparatus 10 may pass through the inside of the universal cord of an endoscope 2.
For this reason, the signal cable for synchronous control is not needed.
Other composition and effects are the same as the above-mentioned embodiment.
The same symbol is given to the same component, and description is omitted.

【００４７】
また、図１５に示すように光などを使って照明光切換装置１８と撮像用アダプタ９′とを同期させるようにしてもよい。すなわち、タイミングコントローラ１８２より出力される同期信

[0047]
Moreover, as shown in Diagram 15, it may be made to synchronize the illumination light switching apparatus 18 and adapter 9' for an image pick-up using a light etc.
That is, the synchronising signal output from the timing controller 182 is input into modulator

号を変調器１８５に入力し、この変調器１８５で周波数変調などで変調して例えば、この変調器１８５で変調した変調波で近赤外光を発生するＬＥＤをドライバ１８６を介して駆動する。ＬＥＤから出射した近赤外光は壁や天井などで反射して撮像用アダプタに９′に入射する。そして、この近赤外光を受けた受光器９２からバンドパスフィルター（ＢＰＦ）９３で雑音をカットし、さらに復調器９４で同期信号に復調し、この同期信号で反射ミラーを切り換えるようにドライバ９５を駆動する。なお、光をの代わりに電波，音波，超音波等を使用してもよい。

185.

An LED which generates a near-infrared light is actuated via driver 186 by the modulated wave which carried out the modulation by frequency modulation etc. by this modulator 185, for example, was modulated by this modulator 185.

It reflects from walls, the ceiling, etc. and incidence of the near-infrared light radiated from LED is carried out to the adapter for an image pick-up at 9'.

And, noise is omitted by the band pass filter (BPF) 93 from the light receiver 92 which received this near-infrared light.

Furthermore it demodulates to a synchronising signal by demodulator 94.

Driver 95 is actuated so that the reflective mirror may be switched with this synchronising signal.

In addition, an electromagnetic wave, a sound wave, an ultrasonic wave, etc. may be used instead of light.

【００４８】

ところで、蛍光観察と通常観察を行うためには蛍光観察用光源装置と通常観察用光源装置との２つ用意しなければならなかった。そこで、以下のように光源装置を構成することによって１つの光源装置で蛍光観察と通常観察とを行うようにしている。

[0048]

In order to perform fluorescent observation and a usual observation by the way, two of the light source device for fluorescent observation and the usual light source device for observation had to be prepared.

Then, it is made to perform fluorescent observation and a fluorescent usual observation by the one light source device by constituting a light source device as follows.

【００４９】

図１６及び図１７に示すように

[0049]

As shown in Fig. 16 and 17, for light source

光源装置１９は、光源ランプ１９２の前面に波長の異なる赤色（Ｒ）と緑色（Ｇ）と青色（Ｂ）の代わりにフラビンの蛍光観察の励起光に適した４００～４６０ｎｍの間の可視光とを順次照射するフィルタ１９１ｒ，１９１ｇ，１９１ａを配置させた回転フィルタ１９１を配設すると共に、蛍光観察用カメラ８の回転フィルタ８１には、前記回転フィルタ１９１の励起用フィルタ１９１ａに対応する位置に４８０～５２０ｎｍ帯域の第１のフィルタ８１ａ及び６３０ｎｍ以上の帯域の第２のフィルタ８１ｂを配設して構成されている。

device 19, while arranging the rotating filter 191 which arranged filter 191r,191g,191a which sequentially irradiates the visible light between 400 - 460 nm suitable for the excitation light of fluorescent observation of flavin instead of red colour (R) and the green (G) and blue (B) with differing wavelengths in the front of the light-source lamp 192, in the rotating filter 81 of the fluorescent camera for observation 8, first filter 81a of 480 - 520 nm bands and 2nd filter 81b of band 630 nm or more are arranged to the position corresponding to filter 191a for excitation of the above-mentioned rotating filter 191, and it is constituted.

【００５０】
このように、回転フィルタ１９１と回転フィルタ８１とを同期させて回転し、励起用フィルタ１９１ａを光が通過している間、回転フィルタ８１の第１のフィルタ８１ａ及び第２のフィルタ８１ｂで順次それぞれの帯域の蛍光を検出することによって蛍光内視鏡像を得るようにしている。

[0050]
Thus, it rotates by synchronizing the rotating filter 191 and the rotating filter 81.

While the light has passed filter 191a for excitation, it is made to obtain a fluorescent endoscope image by sequentially detecting the fluorescence of each band by first filter 81a and 2nd filter 81b of the rotating filter 81.

【００５１】
なお、回転フィルタは、例えば１／６０～１ｓの周期で同期して回転している。

[0051]
In addition, the rotating filter synchronizes 1/60 - 1s periods, for example, and is rotated.

【００５２】
また、現行の光源はＲ，Ｇ，Ｂの３原色を用いているが、本実施例では青色の代わりに励起腔用のフィルタを配設しているので、本来の色と異なるので、図示しないＣＣＵで色補正を行っている。

[0052]
Moreover, the present light source uses the three primary colors of R, G, and B.

However, instead of blue in this embodiment, since the filter for excitation cavities is arranged, since it differs from the inherent colour, the color correction is performed by CCU not illustrated.

【００５３】
さらに、光源用アダプタ１８のタイミングコントローラ１８２とスーパーインポーズ回路１８３とは接続されず、常に通常内視鏡画像に蛍光内視鏡画像がスーパーインポーズされた状態で表示されるようになっている。このため、時分割による光量の現象を防止している。

[0053]
Furthermore, the timing controller 182 and the superimposition circuit 183 of the adapter for light sources 18 are not connected. Normally, after the fluorescent endoscope image has superimposed in the usual endoscope image, it displays.

For this reason, the phenomenon of the quantity of light by the time division is prevented.

【００５４】

[0054]

【発明の効果】
前述したように本発明によれば、通常観察用の光源装置及び撮像手段と蛍光観察用の光源装置及び撮像手段とを交換することなく、通常観察及び蛍光観察を選択的に行える内視鏡装置を提供することができる。

[EFFECT OF THE INVENTION]
As mentioned above, according to this invention, the light source device for a usual observation, image-pick-up means and the light source device for fluorescent observation, and image-pick-up means are not interchanged.

The endoscope apparatus which can perform selectively usual and fluorescent observation can be provided.

【図面の簡単な説明】

[BRIEF EXPLANATION OF DRAWINGS]

【図１】
図１ないし図５は本発明の一実施例に係り、図１は内視鏡装置の概略構成を示す説明図

[FIGURE 1]
Fig. 1 or 5 concerns one embodiment of this invention.
Diagram 1 is an explanatory drawing showing the schematic composition of an endoscope apparatus.

【図２】
回転フィルタの概略を示す説明図

[FIGURE 2]
Explanatory drawing showing the outline of a rotating filter

【図３】
正常部と病変部にレーザ光を照射したときの蛍光感度と波長の関係を示す図

[FIGURE 3]
The diagram showing the relationship of the fluorescent sensitivity and the wavelength when irradiating a laser light to a normal part and a disease part

【図４】
イメージインテンシファイアの概略構成を示す断面図

[FIGURE 4]
Sectional drawing showing the schematic composition of an image intensifier

【図５】
画像処理装置の概略構成を示すブロック図

[FIGURE 5]
The block diagram showing the schematic composition of an image processing device

【図６】
図６及び図７は本発明の第２実施例に係る内視鏡装置の概略構成を示す説明図

[FIGURE 6]
Fig. 6 and 7 is an explanatory drawing showing the schematic composition of the endoscope apparatus based on the second embodiment of this invention.

【図７】
内視鏡画像の蓄積・読み出しのタイミングを示すタイミングチャート

[FIGURE 7]
The timing chart which shows the timing of storing * reading the endoscope image

【図８】
光源装置からの照明光と撮像用カメラへ入射する光とのタイミングを示すタイミングチャート

[FIGURE 8]
The timing chart which shows the timing of the illumination light from a light source device, and the light which incidents to the camera for an image pick-up

【図９】
画像経路変化装置の概略構成を示す説明図

[FIGURE 9]
Explanatory drawing showing the schematic composition of an image path varying apparatus

【図１０】
撮像用アダプタ内での蛍光用カメラ側への外来光入射防止手段の概略構成を示す説明図

[FIGURE 10]
Explanatory drawing showing the schematic composition of extraneous-light incidence prevention means by the side of the camera for fluorescence within the adapter for an image pick-up

【図１１】
受光器とミラーとの位置関係を示すタイミングチャート

[FIGURE 11]
The timing chart which shows the position relationship between a light receiver and a mirror

【図１２】
蛍光観察用カメラの接続検知手段の概略構成を示す説明図

[FIGURE 12]
Explanatory drawing showing the schematic composition of connection detection means of the fluorescent camera for observation

【図１３】
蛍光観察用カメラの接続用アダプタへのたの取り付け方を示す説明図

[FIGURE 13]
Explanatory drawing showing how to the adapter for connection of the fluorescent camera for observation to attach

【図１４】
内視鏡装置の他の同期制御手段を示す説明図

[FIGURE 14]
Explanatory drawing showing the other synchronous-control means of an endoscope

apparatus

【図１５】
内視鏡装置の別の同期制御手段を示す説明図

[FIGURE 15]
Explanatory drawing showing another synchronous-control means of an endoscope apparatus

【図１６】
内視鏡装置の他の構成を示す説明図

[FIGURE 16]
Explanatory drawing showing the other composition of an endoscope apparatus

【図１７】
フィルタの概略構成を示す説明図

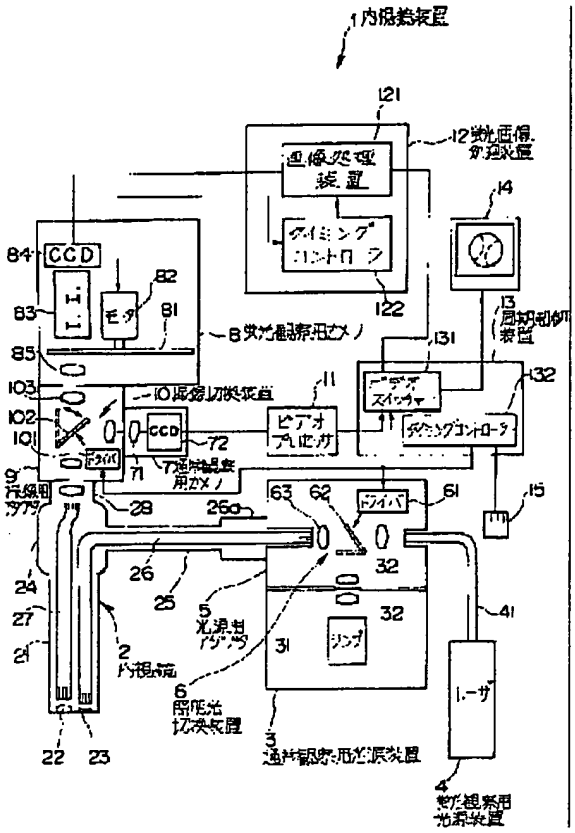
[FIGURE 17]
Explanatory drawing showing the schematic composition of a filter

【符号の説明】
１…内視鏡装置
２…内視鏡
３…通常観察用光源装置
４…蛍光観察用光源装置
５…光源用アダプタ
６…照明光切換装置
７…通常観察用カメラ
８…蛍光観察用カメラ
９…撮像用アダプタ
１０…撮像切換装置
１１…ビデオプロセッサ
１２…蛍光画像処理装置
１３…同期制御装置

[EXPLANATION OF DRAWING]
1... endoscope apparatus
2... endoscope
3... Usual light source device for observation
4... Fluorescent light source device for observation
5... Adapter for light sources
6... illumination light switching apparatus
7... Usual camera for observation
8... Fluorescent camera for observation
9... Adapter for an image pick-up
10... image-pick-up switching apparatus
11... video processor
12... fluorescence image processing device
13... synchronous-control apparatus

【図１】

[FIGURE 1]

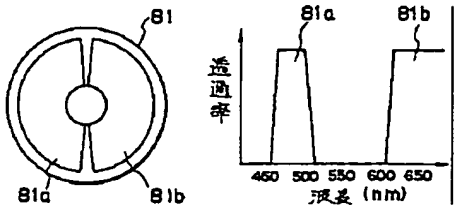


[translation of Japanese text in Figure 1]

also refer to EXPLANATION OF DRAWINGS

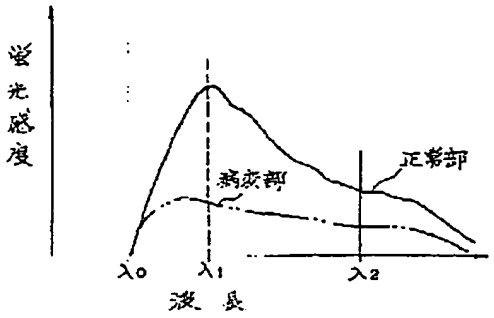
61	driver
121	image processor
122	timing controller
131	video switcher
132	timing controller

【図２】 **[FIGURE 2]**



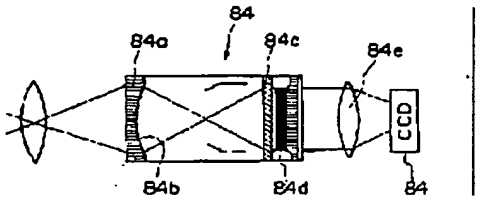
[translation of Japanese text in Figure 2]
vertical axis: permeation rate
horizontal axis: wavelength (nm)

【図３】 **[FIGURE 3]**

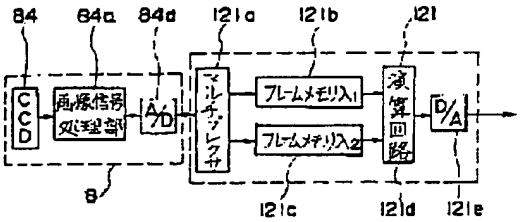


[translation of Japanese text in Figure 3]
vertical axis: fluorescent sensitivity
horizontal axis: wavelength
upper line: normal region
lower line: diseased region

【図４】 **[FIGURE 4]**



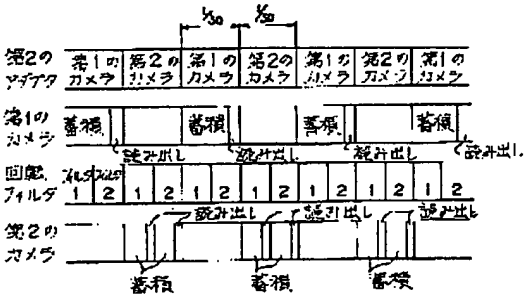
【図５】 [FIGURE 5]



[translation of Japanese text in Figure 5]

84a image signal processor
121a multiplexer
121b frame memory (lambda) 1
121c frame memory (lambda) 2
121d calculation circuit

【図７】 [FIGURE 7]

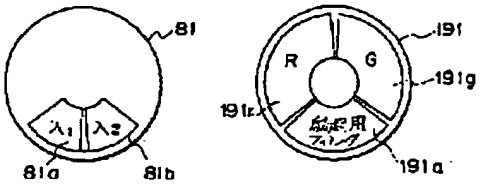


[translation of Japanese text in Figure 7]

by rows:
2nd adapter: 1st camera, 2nd camera, 1st camera, 2nd camera, ,,,

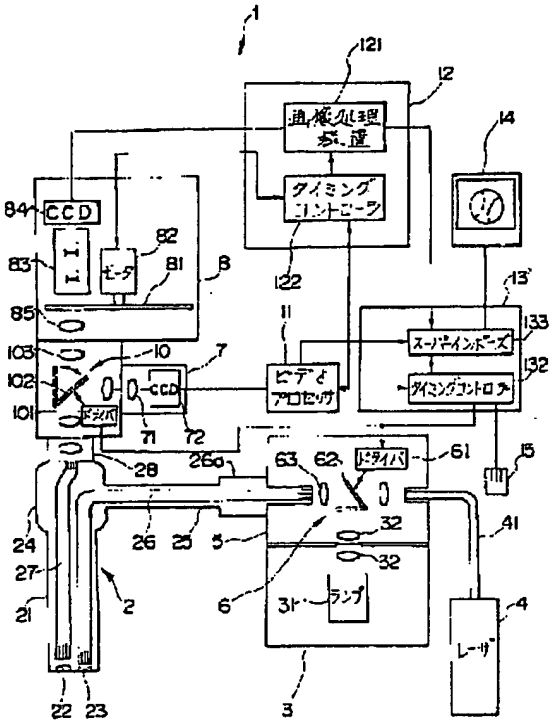
1st camera: accumulate, read out, accumulate, read out, ...
revolving filter: filter 1, filter 2, filter 1, filter 2, ...
2nd camera: accumulate, read out, accumulate, read out, ...

【図１７】 **[FIGURE 17]**



[translation of Japanese text in Figure 17]
191a excitation filter

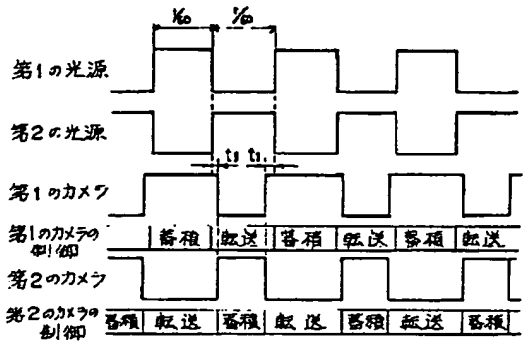
【図６】 **[FIGURE 6]**



[translation of Japanese text in Figure 6]

31	lamp
61	driver
82	motor
101	driver
121	image processor
122	timing controller
132	timing controller
133	superimpose

【図８】 **[FIGURE 8]**



[translation of Japanese text in Figure 8]

by rows:

1st light source

2nd light source

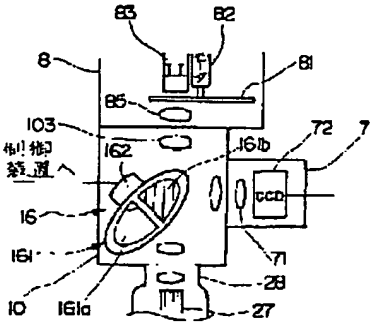
1st camera

control of 1st camera: accumulate, transfer, accumulate, transfer, ...

2nd camera

control of 2nd camera: transfer, accumulate, transfer, accumulate, ...

【図９】 **[FIGURE 9]**

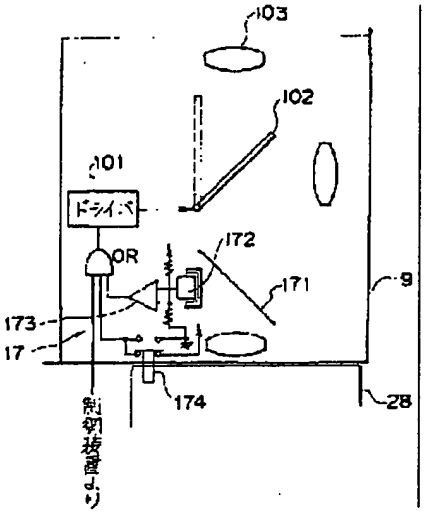


[translation of Japanese text in Figure 9]

below 103: to control unit

82 motor

【図１０】 **[FIGURE 10]**

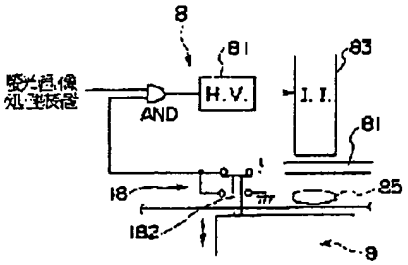


[translation of Japanese text in Figure 10]

from the control unit

101 driver

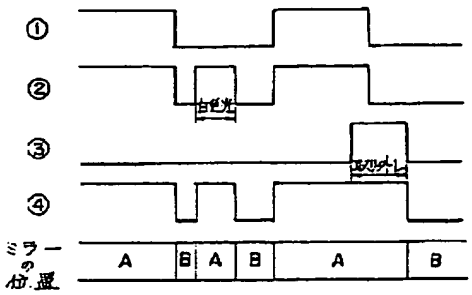
【図１２】 **[FIGURE 12]**



[translation of Japanese text in Figure 12]

fluorescent image processor

【図１１】 **[FIGURE 11]**



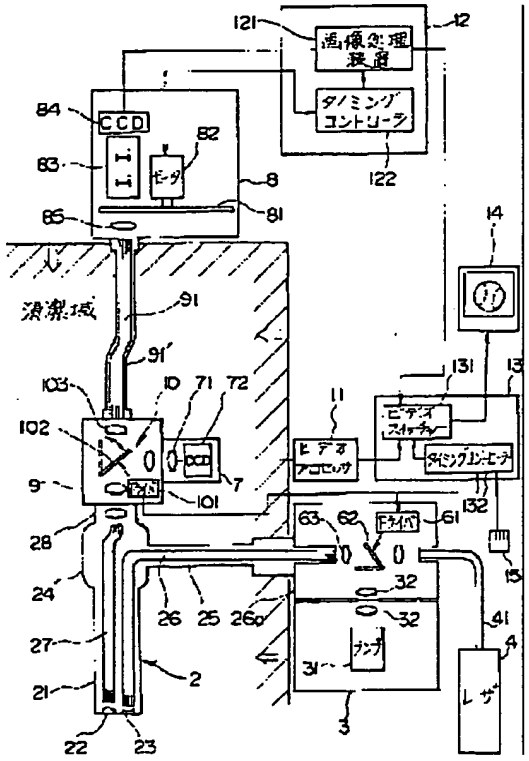
[translation of Japanese text in Figure 11]

2 white light

3 remove

at bottom: mirror position

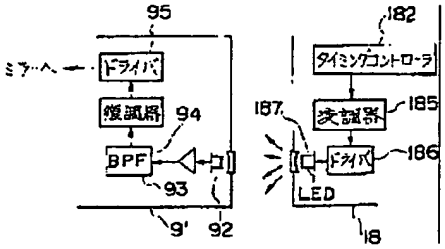
【図１３】 **[FIGURE 13]**



[translation of Japanese text in Figure 13]

31 lamp
61 driver
82 motor
101 driver
121 image processor
122 timing controller
131 video switcher
132 timing controller
left of 91: sterile region

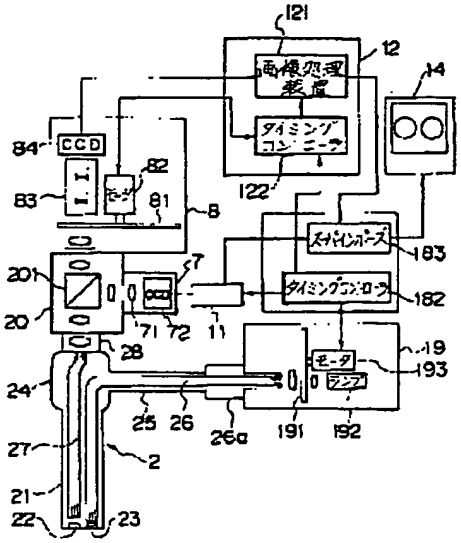
【図１５】 **[FIGURE 15]**



[translation of Japanese text in Figure 15]

95 driver
from 95: to the mirror
below 95: demodulator
182 timing controller
185 modulator
186 driver

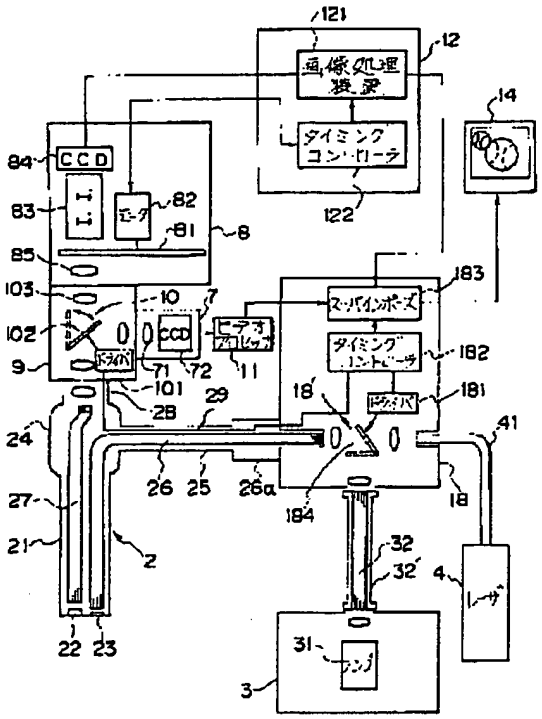
【図１６】 **[FIGURE 16]**



[translation of Japanese text in Figure 16]

82	motor
121	image processor
122	timing controller
182	timing controller
183	superimpose
192	lamp
193	motor

【図１４】 **[FIGURE 14]**



[translation of Japanese text in Figure 14]

31	lamp
82	motor
101	driver
121	image processor
122	timing controller
181	driver
182	timing controller
183	superimpose

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